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FINAL REPORT TO:

HEALTH CARE FINANCING ADMINISTRATION

DEMONSTRATION OF AN INTEGRATED DATA SYSTEM TO PROMOTE COST CONTAINMENT AMONG PRIMARY CARE PHYSICIANS

October, 1982

DEPARTMENT OF COMMUNITY MEDICINE

DARTMOUTH MEDICAL SCHOOL

Hanover
New Hampshire
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PROJECT GRANTS
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DEMONSTRATION OF AN INTEGRATED DATA SYSTEM TO PROMOTE COST CONTAINMENT AMONG PRIMARY CARE PHYSICIANS

HCFA GRANT #18-97538

FINAL REPORT

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I. INTRODUCTION

The Primary Care Cooperative Information Project is a program that attempts to integrate the interests of community physicians, medical school faculty and health policy makers. The COOP Project started in 1977 with 14 practices and has grown to include almost 50 practices in northern New England. The organization is working in five areas -- computerized medical information systems, practice management, quality assurance, cost-effectiveness, and education. A major objective is for the COOP to become self-sufficient by the time start-up funds end.

A few of the major accomplishments of the past year are:

- Selection of a new computerized data system for small primary care practices -- the MOMS/Altos medical information system.
- Development of a system of management audits to improve practice efficiency.
- Revisions of the monthly, quarterly, and year-end feedback reports.
- Completion of a research project on patient functional health status and initiation of prospective studies on fatigue and smoking.
- Improvement and expansion of the cost-consciousness education program for medical students.
- Publication of several papers on the COOP Project in journals (Exhibit 1)
- Presentations on work done by the COOP at major national meetings such as Symposium on Computer Applications in Medicine, North American Primary Care Research Group, and Conference on Research in Medical Care.

The major problem encountered this past year was the unexpected loss of federal funds that had been awarded to assist in starting the COOP Project. This cutback required us to reduce the organization's scope of work and staff. The major changes brought about by the loss of funds, in excess of $110,000, are summarized below:

Medical Information System: As of January 1, 1982, practices had two options with respect to submission of encounter data:

- Use Microcomputer System: COOP practices can use their own computer to enter encounter data (and perform other tasks such as billing and A/R, general ledger, patient callbacks, etc.). The practice is responsible for purchasing the hardware. COOP funds will be used to provide needed software for each system and to produce feedback reports and special cross practice analyses.
- Use Manual System: COOP practices can continue using the manual batch-and-mail approach to submit encounter data. The practices are responsible for purchasing this service from the COOP at a charge of 38¢ per encounter form.

The changes in the MIS system were made to: (1) shift the costs of encounter form data entry from COOP grant support to practice self-payment; and (2) stimulate quicker development of a more powerful and cost-effective microcomputer-based, distributed data system.

Practice Management: Beginning January 1, 1982, the COOP began scheduling management audits to provide structured, systematic consultation. All management assistance beyond this base amount will be performed on a fee-for-service basis at a cost of $60 per visit payable by the practice.

The changes in Practice Management were intended to: (1) ensure that all practices receive systematic assistance; and (2) prepare the way for making management services self-supporting in future.

Quality Assurance: Effective January 1, 1982, the Quality Assurance Coordinator and Research Assistant positions were eliminated. Practices may continue to request assistance from the Project Director or Clinical Cost-Effectiveness Research Coordinator to design quality assurance projects and analyze the resultant data. Practices, however, will provide the manpower to gather data for quality assurance projects.

The intent was to continue facilitating quality assurance activities in motivated practices using remaining personnel, but reduce COOP costs by eliminating two positions. It was hoped

that support could be obtained to revise and significantly improve our work in this important area through a new grant submitted jointly by St. Louis Park Medical Center and Dartmouth Medical School.

Education: The Coordinator for Continuing Medical Education position was eliminated on December 1, 1981. The Continuing Medical Education Committee determined that this was not an area where the COOP needed to promote independent activity. Rather, it was judged preferable to integrate the education function into other areas (e.g., practice management, quality assurance, research, and medical information system). The Coordinator for Medical Student and Resident Education continued through June, 1982 in order to have the opportunity to revise and conduct a second wave of cost-awareness education activities.

Clinical Cost-Effectiveness Research: There was no change in research plans. Clinical cost-effectiveness studies on patient functional health status, impact of practice-based smoking cessation programs, and patients with a chief complaint of fatigue are all in various stages of progress.

The next section provides more detailed information about progress made and problems encountered during the past year.

Main initiatives for the next year will be to:

- develop and expand the new computerized, office-based data system;
- achieve concensus on a research mission for the years ahead; and
- plan further the best strategy for becoming self-sufficient.

II. PROGRESS TOWARDS MEETING OBJECTIVES

The progress report is divided into five functional areas -- medical information system, practice management, quality assurance, cost-effectiveness research, and education.

A. Medical Information System:

1. Background:

The central element in achieving the goals and objectives of the COOP Project is the Medical Information System (MIS) and Cross Practice Data Base. The MIS is a permanent feature of each of the practices in the COOP Project. The MIS is not an add-on data collection effort. It is constructed as an integral part of each practice's patient encounter, billing, accounts receivable, and general ledger system. The MIS is tailored to the requirements of each practice yet contains a basic minimum data set which is common to all practices. This design allows for flexibility within the practices and yet is cost-effective for the network as a whole. The data set includes: patient identifier (Hogben Code: first four letters of last name, first initial, birthdate, and sex), zip code, all diagnoses, all procedures, all charges by procedure, provider identifier, and visit disposition. This minimum data set has been collected on all patient visits for all participating practices over the last two years.

Initially, the collection of the minimum data set was designed in such a way that the data would be entered into a computer located at Dartmouth Medical School. This is called the batch-and-mail system. Encounter forms are completed for the patient visit at the practice, batched with control totals, and forwarded to Dartmouth for entry into the computer. This process was designed as the first phase of Medical Information System development. It was implemented to begin building the data base as quickly as possible and with little interruption or normal procedures in the practice. The second phase was to design a mini-computer office-based computer system. When fully designed, this office based computer system will be designed to achieve all of the necessary accounting functions for the practices as well as to provide the COOP with its minimum data set. This will be stored in the Cross Practice Data Base.

2. Progress and Problems:

The batch-and-mail system has been in place for the last two years. During the past year, efforts have been directed at refining the practice feedback reports. The monthly reports and quarterly reports were redesigned to compare current month or current quarter data to the same period in the prior year.

In addition, the format of the reports were changed to be more readable. Exhibits 2 and 3 present the redesigned monthly and quarterly reports. Exhibit 4 is a sample of the annual report for the calendar year 1981. Practices have indicated unanimously that they find the annual report very beneficial and have used it to assess the status of their practice.

One of the services that the COOP provides its participating practices is the ability to respond to specific data requests. During the past year, there were 26 requests for special data reports which included 47 health centers. This is similar to the prior year which totalled 25 requests involving 45 health centers. Exhibit 5 presents a sample of a typical request and the report which resulted from that request. During 1981-82, considerable effort was directed at defining the objectives of the practice-based mini-computer system and determining the hardware configuration and software systems that would meet these objectives. This effort was accelerated by the loss of federal funding. The impact of the loss of funding was to transfer the cost of the batch-and-mail system to the practices. Thus, it became imperative for the COOP to find an efficient and cost-effective office-based computer system that would allow the practices to continue to build the Cross Practice Data Base and not impose a financial burden on the practice. The cost to the practices to maintain the batch-and-mail system was approximately 38¢ per encounter form.

In our efforts to determine the most efficient and effective hardware/software systems available, the COOP completed a two-year evaluation of the experiment with the Datamedic System. The Datamedic system is a practice-based micro-computer that is linked by telephone lines to a central computer located in Long Island, New York. The microprocessor captures transaction data and maintains patient balances. Each night, the daily transactions are forwarded to Long Island where they are stored until month end processing takes place. The central facility produces management reports, as well as patient billing statements and accounts receivable data. The results of the two-year evaluation are presented in Exhibit 6. In summary, the evaluation concludes that there was no real dollar savings in the Datamedic approach. There was, however, increased staff satisfaction with the system. One tangible benefit of the Datamedic system was the ability of practices to spend more time on delinquent accounts. In addition, the Datamedic system allowed practices to increase their capacity for work. Two practices were able to increase their patient volumes by adding new provider while not increasing billing staff. However, the Datamedic system was highly structured and inflexible. This was considered a drawback by the physicians in these practices. It was our conclusion that a microcomputer tied to a central computer was not the most cost-effective way to proceed with computerization within small practices. Our efforts, therefore, were directed at finding true stand-alone mini-computers which would be office-based.

Exhibit 7 presents the objectives for the office-based micro- or mini-computer system. Exhibit 8 is a summary of the software packages that were evaluated by the COOP in our search to find a software system to be used by the practices. Exhibit 9 presents the results of our evaluation. Our initial recommendation was a software package produced by Professional Business Systems in San Francisco, California, called "Softcare" which was running on an Apple II computer. However, due to problems encountered with the software, this selection had to be negated and our final selection was the Medical Office Management System (MOMS) produced by Health Data Products, Incorporated of California which runs on an Altos computer. Exhibit 10 contains a brief description of the MOMS/Altos system.

The initial selection of the Apple/Softcare System received a favorable response by the COOP practices. Five practices were selected to be test sites for implementation of the Apple/Softcare System. Apple computers were purchased and placed in the practices and the software was ordered from Softcare. As an interim measure, between ordering the Softcare System and its implementation, a program was developed to allow the Apple practices to collect encounter data which would be forwarded to the COOP for processing and entry in the Cross-Practice Data Base. During this interim period, the Softcare System was withdrawn from the marketplace by its developer. The developer indicated that it would no longer support the Softcare System in an Apple environment. As a result of this action, the COOP again had to review its evaluation of existing software systems. After review of the results of the software evaluation, we selected the Medical Office Management System package. A trip was made to California to view the MOMS System in a practice environment, and a favorable decision was reached. Altos computers were ordered for three of the five Apple practices. (The COOP agreed to buy back the Apple computers from the practices at no cost to the practice. In turn, these Apple computers were sold to individuals in the private marketplace.) The MOMS System was modified slightly to meet COOP specifications and was implemented on September 1, 1982. It is anticipated that the Datamedic practices will convert to the MOMS/Altos system during calendar year 1983. After these practices have been operating for a year, we will conduct another evaluation study to compare the new mini-computer system with the Datamedic system.

3. Workplan for 1982-1983:

During the coming year, we will continue to support the batch-and-mail system and refine, as necessary, the monthly, quarterly, and annual reports. We will continue to encourage and respond to data requests from COOP practices.

Implementation of the MOMS/Altos System began in September when two practices went on-line with the new system. A third practice will go on-line in October. Barring any difficulties with these implementations, further start-ups will begin in January of 1983. Considerable interest has been expressed by practices associated with Medical Care Development in Augusta, Maine and practices associated with Kennebec Valley Regional Health Association in Waterville, Maine. It is anticipated that two practices from each of these locations will begin using the MOMS/Altos System in the first quarter of 1983.

The new MOMS/Altos System will be used at the Alice Peck Day/ Dartmouth Family Practice Center. The Family Practice Center will open its doors November 1, 1982 and will be the clinical arm for the Department of Community and Family Medicine of Dartmouth Medical School. It will serve as the site for Dartmouth's Family Practice Residency Program, which will have its first residents in 1985. The system will be used as part of the residents' education and significant emphasis will be placed on clinical cost-consciousness and cost-containment. It is our hope that the residents' exposure to this type of office-based mini-computer system will be carried over into the practices of these residents when they become independent practitioners. The COOP will continue in its efforts to market the Superbill to practices located throughout Vermont and New Hampshire. Page 21 presents a Gantt Chart for the tasks to take place during the upcoming year.

B. Practice Management Consulting:

1. Background:

Practice management consultation is one of the services which the COOP provides to its member practices. The practice management specialist assists the practices in making use of the feedback reports to increase management efficiency and hold down operating costs. The management consultant coordinates cross-practice administrative studies, observes changes in practice patterns over time, and provides ad hoc consultation. The activities in the areas of practice management have been divided into two principle areas -- reactive activities and proactive activities. The central goal is to assist practices in achieving efficient and cost-effective operations for the delivery of health care. This requires assisting the practices with both organizational and operational processes, since both affect the quality and cost of care. The management specialist believes the best way to approach this in an organized fashion is through the budget process. The budget process, if carried out properly, calls for the continual evaluation of programs and objectives in light of actual performance versus projected performance. Thus, the proactive efforts are directed at assisting each practice in developing a budget process followed by periodic evaluation

versus predicted operating results. The results of this process will only become apparent after a relatively long period of time.

2. Progress and Problems:

Activity in 1982 can be divided into three specific areas: (1) reactive consulting, (2) proactive activities, and (3) management audit. Exhibit 11 summarizes the requests for consulting assistance that were received from the practices. This represents the reactive portion of the management consulting activity. The 19 requests in this past year compares to 16 requests made during the prior year.

In the proactive area, our efforts were concentrated on the revenue and expense reporting system. This system was designed and implemented during the 1981-82 year, and a number of problems were encountered. The initial system, which was described in the last annual report, proved to be cumbersome for the practices and full cooperation was difficult to attain. A restructuring of the system was undertaken, therefore, to reduce the level of effort on the part of the practices but to still develop a meaningful categorization of expense categories.

The revised revenue and expense reporting system is working much better. Cooperation among practices is nearly at the 100% level, although the time lag ranges from three to six weeks. Difficulties have been experienced in assessing computer programs to analyze the revenue and expense data. It is hoped that these problems can be overcome by January, 1983. The practices have indicated a strong desire to receive data on revenues and expenses. The first cross-practice report will be mailed to the practices in advance of the Annual COOP meeting scheduled for October, 1982.

The COOP decided that it needed to develop a more structured approach to management consulting. Accordingly, the concept of the management audit was developed and implemented during 1981-1982. Management audit is defined as a methodical examination of whether or not management is truly accomplishing planned goals and objectives. There are three basic objectives to the management audit: (1) efficiency, (2) economy, and (3) effectiveness. Management audit criteria must be structured to evaluate organization performance for efficiency, plus compare management accomplishments with plans to measure effectiveness, and must identify organizational/operational deficiencies and potential areas of improvement.

Application of these basic objectives can significantly aid the practice in knowing where it is, where it wants to go, and how it wants to get there. The management audit will become a continuous function for the COOP. Each participating medical practice will receive two or three management audit visits per year. The initial visit was conducted in the second quarter of 1982, and was used to establish a baseline for subsequent visits. This visit was highly structured, but uncomplicated and non-

threatening. The principle objectives of the first visit were to collect: (1) objective facts about the organization of the practice; (2) objective data about the financial condition of the practice; and (3) stated goals and objectives for the practice by the physician and his or her key office staff.

Exhibit 12 was used to collect data about the structure of the practice. This fact sheet will be updated at each management audit visit and will serve as a face sheet in the practice management file for each COOP practice. Exhibit 13 was used to collect data concerning the financial condition of each practice. This data will be monitored quarterly. Exhibit 14 was used as a guideline for discussion about the goals and objectives of the practice. Following the initial management audit, a follow-up visit was made to discuss ramifications stemming from the baseline information gathered. Summary data were collected and reported back to the practices in comparative form. The format of these reports is included in Exhibit 15.

No major difficulties have been encountered to date with the management audit process. One difficulty is arising out of a lack of resources related to the management audit process. It requires approximately five to six hours of effort for each management audit, exclusive of travel. Given the number of practices in the COOP, there is not enough resource time to actually carry out the three management audit visits per calendar year. It is apparent that this will have to be adjusted to two management audits per year per practice.

3. Workplan for 1982-1983:

During the coming year, all three types of management consulting will continue to be carried out. The consultant will respond to requests for management assistance as time and resources allow. In the proactive area, we will continue to stress the importance of the revenue and expense system. We hope to have all problems resolved by the end of the third quarter of 1982. Management audits will continue. It is anticipated that as the process proceeds, the practices will realize many benefits from management audit. The Gantt Chart on page 22 contains the activities and timetables for management consulting planned for next year.

C. Quality Assurance

1. Background:

The COOP Project aims to help physicians provide better health care at lower cost. An important strategy for reaching this aim is to foster the development of voluntary quality assurance

systems within practices that are in the COOP. The quality assurance system that the COOP developed included two key ingredients: (1) an ongoing data system (i.e., the Cross Practice Data Base) useful in conducting quality assurance work; and (2) skilled personnel to assist practices in planning and executing intra-practice and inter-practice quality assurance studies.

2. Progress and Problems:

The 1981-82 fiscal year brought significant cutbacks in COOP funding, especially in the area of Quality Assurance. While many individual practices continued on their own to do audits, the loss of our Quality Assurance Coordinator and Research Assistant has limited both the development of cross-practice quality assurance studies and provision of technical assistance to the practices.

We have been busy with the studies on Functional Health Status, Fatigue, and Smoking Cessation. Although these will have quality of care implications for COOP practices, the studies represent more of a clinical cost-effectiveness research focus than quality assurance.

The first major quality assurance accomplishment was completion of a cross-practice study on the costs and effects of weight loss treatment provided by four different COOP practices. All data has been collected, the results have been fed back to participating practices, and Drs. Stamps and Catino are drafting a paper to publicize the results.

The second major quality assurance accomplishment in 1981-82 has been a redirection of our thinking in the face of resource limitations and relative dissatisfaction with our success in the past. Some of our frustrations, and some of our important lessons, are discussed in the paper prepared for the August, 1982 Campobello Conference of the Northeast Canadian/American Health Council (Exhibit 16) and in our Antibiotic Study paper published in July, 1982 in the Quality Review Bulletin (Exhibit 17). The antibiotic paper was of great interest to the editors of that Journal because of our frank discussion of our methodologic problems and acknowledgement of the limited impact the study had on the practices.

At this point in time, we cannot say with any certainty that our formal quality assurance programs have measurably improved our physicians' intuitive informal quality assurance systems (i.e., "I'm unhappy with the outcome of this patient's care -- I need to do something about it"). However, we are confident that we've come closer to that goal; and we are convinced that a voluntary, cooperative system like ours, based on a multipurpose data system to aid motivated practitioners, can help identify problems that would otherwise be overlooked, define the dimensions of those problems, and point the way to solutions that improve the quality of medical practice.

3. Workplan for 1982-1983:

The quality assurance objectives for the year ahead follow:

a. Continue to feedback quality assurance-related data to COOP practices.

b. Continue to provide technical assistance to practices on their request (to the extent resources allow).

c. Refine the data system to provide more reliable information in the area of quality assurance. We need to gain more experience with the data network and its ability to help solve "office system" problems such as how to:

  - define and identify groups of patients "lost to follow-up";
  - improve the reliability of diagnostic codes;
  - efficiently enter medications into the data system; and
  - expand our "automatic" audit and retrieval capabilities.

d. The St. Louis Park/COOP proposal described a general problem seeking/problem solving approach. When this general quality assurance system defines a purely clinical problem area, we need to have a clinical audit method that can efficiently and effectively measure the quality of detailed clinical process. A Sanazzaro or Palmer-type approach to clinical audit may well be the answer to this aspect of the COOP's quality assurance system. We plan to investigate this further in 1983.

A Gantt Chart for quality assurance activities is shown on page 23.

D. Clinical Cost-Effectiveness Research:

1. Background:

An objective of the COOP Project is to conduct practical research on relevant primary care topics to assess the cost and effects of health care delivery. The COOP is especially interested in studying the impact of medical care on functional health status and patient expenditures in addition to more conventional clinical

outcomes. It is believed that our work in clinical cost-effectiveness research can produce two benefits. First, the process of participating in the design, conduct and analysis of these research topics may increase the interest and awareness of participating physicians in finding economical methods of providing effective treatment to their patients. Second, publication of the results may contribute to the literature regarding the costs and health consequences of primary care and stimulate new practice networks to engage in similar research.

In addition to prospective research, the Cross Practice Data Base is used to provide physicians with feedback that shows their own practice's average charges per patient per year (for selected age-sex groups and diagnoses) compared to other COOP practices. This is done to increase COOP physicians' knowledge about how their pattern of providing care compares with others with respect to cost.

During the past year, three main accomplishments were realized:

- Functional Status Study: An observational study of more than 1200 adult patients (N=1227) served by 28 different medical practices was planned, implemented, and completed.

- Fatigue Study: A one-year longitudinal study on the functional health status, clinical services, and health expenditures of patients bothered by fatigue and a matched control group of patients (N=437) was undertaken.

- Smoking Cessation Study: A one-year controlled intervention study on smoking cessation was conducted. It tested the effectiveness of physician-directed efforts at inducing patients to quit cigarette smoking, especially among persons with chronic respiratory conditions or at-risk for coronary heart disease.

Further information on each of these three projects is provided next.

FUNCTIONAL HEALTH STATUS: A CROSS-SECTIONAL STUDY

Despite the fact that more than two-thirds of all patient visits occur in primary care practices, very little data is available on functional health status at time of visit, or on subsequent changes in function, medical care utilization, or expenditures of patients served by primary care physicians. The purpose of the study was to document the health status of primary care patients at time of visit and the degree of physician-patient agreement on ratings of health status. This may lead to prospective intervention studies that can attempt to improve or maintain functional health status.

Methods: A cross-sectional, observational research design was used to gather data on health status of adult patients visiting 28 primary care practices. Health status ratings were made independently by patients (N=1227) and physicians (N=47). The research setting, study questions, operational definitions, research design, data collection procedures, sample size, data analysis, and results are described in the paper contained in Exhibit 18.

Results: The findings indicated that 12% of patients rated their physical limitations as major and 8% rated major emotional emotional limitations during the past month. The comparable assessments by physicians were 5% and 4% respectively. These differences in assessments between patients and physician were very significant ($p < .001$).

An attempt was made to gather more information as to the reasons for major ratings disagreement. A total of 297 cases occurred where there was large disagreement between the patient and clinician on global ratings of either physicial or emotional functioning. The clinicians were asked to review the medical records of these patients to try to determine the reason for disagreement. Responses were received on 60% of the patients. The reasons most frequently given for the disagreement were: (1) clinican error (44%), (2) patient error (38%), (3) insufficient knowledge of patients (12%), and (4) miscellaneous (6%). Of the cases where the clinicians felt that the patient's rating was incorrect (N=70), the reasons offered were: (1) patient tends to deny disability (28%), (2) patient tends to exaggerate disability (28%), (3) patient had major psychological problems (17%), (4) patient likely misunderstood the question (9%), and (5) other miscellaneous (17%).

When patients who rated themselves as having no limitations in physical functioning were compared to patients rating themselves as having major limitations, it was found that the no limitations groups tended to be younger (average age 41 vs. 70 years), employed (60% vs. 27%), and had attained a higher level of education (12.9 years vs. 11.6 years). No significant differences were found for sex.

The most frequent primary diagnoses of patients with major limitations were chronic conditions such as atheroschlerotic heart disease (11%), diabetes (8%), congestive heart failure (6%), anxiety or depression (5%), chronic obstructive pulmonary disease (5%), and arthritis (5%). This contrasts with the leading primary diagnoses of patients free from limitations who were more likely to have acute problems or health maintenance visits (e.g., pregnancy care and birth control, 7%, medical exam, 6%).

Visits and charges per patient increase as patient ratings of functional limitations increase. For example, the no physical limitation group averaged 3.3 visits and $78 in office charges per year compared with the large to extreme limitation group which averaged 7.3 visits and $253 in office charges respectively ($p < 0.001$). Similar findings were observed with respect to emotional functioning. The no limitations group registered 3.1 visits per year and $78 per year while the large to extreme group had comparable figures of 7 visits per year and $185 per year ($p < 0.001$).

Conclusion: Attention in medicine is shifting towards measurement of outcomes that show the ripples that disease and its treatment make throughout the patient's life. Perhaps the most significant finding of this study is that physical and mental function can be easily and routinely assessed in primary care practices.

FATIGUE: A LONGITUDINAL STUDY OF HEALTH STATUS, SERVICES, AND EXPENDITURES

The Fatigue Study represents the second phase, or follow-up portion, of the Cross-Sectional Study of Functional Health Status discussed in the preceding section. A subset of the sample of patients entered into the Cross-Sectional Study were selected for follow-up observations in the Longitudinal Study.

Three groups of patients were selected for the study:

Group 1: Chief Complaint Fatigue: Patients who, in the judgement of the treating clinician, are primarily bothered by fatigue regardless of: (1) other problems which may be present; (2) associated or causative diagnoses already known or suspected (e.g., anemia, heart failure); or (3) the reason for which appointment was made (e.g., hypertension check, annual physical).

Group 2: Occult Fatigue: Patients not identified by the clinician as having a chief complaint of fatigue, scoring in the

> bottom 40% of the vitality scale of the patient health questionnaire, and matching patients in Group 1 on sex and age (± 5 years of Group 1 patient).
>
> Group 3: Comparison Group: Patient not selected to Group 1 or Group 2, scoring in the top 20% on the vitality scale of the patient health questionnaire, and matching patients in Group 1 on sex and age (± 5 years of Group 1 patient).

The objectives of the study were to collect longitudinal, observational data on patients bothered by fatigue to: (1) describe patients' levels of functional health status and the changes that occur over time; (2) describe the types of services and the quantities of these services used by patients per year; (3) determine the proportions of these services that are provided by the primary care clinician, directed by the primary care clinician, and obtained by the patient independent of the primary care clinician; (4) describe the charges and expenditures per patient per year and the proportion of these that are directed by the primary care clinician; and (5) describe the impact of fatigue on patients' functioning, illness conditions that are associated with fatigue, and treatment modes that are effective in alleviating the fatigue.

Process: A total of 437 patients were initially selected for entrance into the Fatigue Study. Of these, 118 were subsequently eliminated for multiple reasons including deafness, mental impairment, no telephone, or refusal to participate. Thus, we completed the first round of follow-up interviews (three months post index visit) on 319 patients.

Round two interviews have been completed (six months post index visit) and round three interviews (one year post index visit) will be finished in October, 1982.

Results: Preliminary analyses of the first two rounds of interview data indicate that 65% of Group 1 and Group 2 patients are still bothered by fatigue six months after the index visit to the clinician. An additional 15% report that, while not currently bothered by fatigue, they have had at least one recurrence of fatigue since their index visit. Over half of the patients that were still fatigued reported that their fatigue was improved since the index visit, while only 13% claimed that the fatigue was worse. A typical fatigue patient:

- is bothered both mentally and physically (nonspecific anatomically) by fatigue;
- is likely to wake up fatigued and will be most bothered by fatigue in the afternoon;

- finds that rest helps alleviate the fatigue; and
- has not been examined by a medical person specifically for fatigue.

It appears that for many patients, stress and work have an adverse effect on their fatigue. Most patients believe that their clinicians are not really helping their fatigue, and while many are taking a prescribed medication, most perceive little benefit from the medicine. No differences were found between Group 1 (Chief Complaint Fatigue) and Group 2 (Occult Fatigue).

The Zung Depression Scale was mailed to each patient at the conclusion of a completed interview. The patient was instructed to complete the questionnaire and return it to the COOP. We received 154 out of a possible 319 (response rate 48%) after Round One interviews, and 142 out of a possible 221 (response rate 69%) subsequent to Round Two interviews. The results suggest that about one-third of the fatigued patients had some form of depression which did not improve over time (e.g., patients were depressed after Round One and Round Two interviews).

Problems Encountered: One significant problem encountered was the large amount of time required per completed patient interview. This averaged three hours per completed interview (i.e., locating respondent, conducting interview, and editing interview). The average duration of interviews was 35 minutes. This required that we simply employ more interviewers than originally planned. We hope to alleviate this problem in future research through the development of a mailed follow-up method with telephone back-up. It is estimated that this will be substantially less costly. The other problem encountered was the attrition rate. Two factors may account for this. First, because this was the first "tracking" study done by the COOP, we were hesitant to push too hard to convince patients to participate. Second, our interviewing procedures were not as well established as they would have been had the COOP had more experience in cohort studies.

SMOKING CESSATION:
AN INTERVENTION STUDY

The COOP has begun a one-year controlled intervention study on smoking cessation in primary care practices. This study topic was selected by a majority vote on all COOP members at the Annual Meeting held in October, 1981. Interested physicians, faculty, and consultants have worked to design the study protocol. The protocol was field tested in two practices to enable us to identify and corrent any problems. The study began in the summer of 1982 with more than 25 practices taking part.

The two prime objectives are to: (1) collect longitudinal observational data on cigarette smoking patients visiting primary care medical practices to determine the effects of smoking on patients' functional health status, health care utilization, and work days lost; and (2) develop, test, and evaluate practical, physician-directed interventions to motivate patients to quit smoking.

Methods: Sample selection criteria follow:

1. Patient currently smokes $\geq$ ½ packs cigarettes per day.
2. Patient age is 21-60 years inclusive.
3. Person is established patient of COOP practice (i.e., patient has had one or more visits to the practice within the last two years).
4. Patient has no limitations in Activities of Daily Living due to any condition other than COPD.

The office receptionist is responsible for screening patients on the first three criteria and the clinician screens on the fourth. Each COOP practice enters a consecutive series of 40 patients meeting entrance criteria into the study. This will yield a projected N=1080. All patients will sign an informed consent agreement and complete a brief (5-10 minute) self-administered questionnaire.

The practices will enter sequentially patients into one of three groups. The first group of patients entered into the study receive "Customary Care". The second group receive an inexpensive respiratory function test of peak expiratory flow (PEF) meter in addition to customary care. The third group of patients receive: (1) the PEF test, (2) a special, brief patient education session delivered by the physician in three to five minutes, and (3) follow-up to reinforce the decision not to smoke among quitters or to motivate cessation among patients still smoking.

Patients in all three groups will receive a mailed follow-up questionnaire to complete and return to the COOP at three months and twelve months post index visit. Trained telephone interviewers will provide these patients with any needed assistance and, if necessary, interview patients in order to maximize the response rate.

The smoking status of patients in Group 3 (Intervention Group) will be determined from the three-month questionnaire. Patients still smoking and wishing to quit will be contacted and asked to select one of the three methods of quitting (cold turkey, self-quit kit, telephone counselling). The COOP will provide any necessary follow-up.

Practice Orientation: The COOP's Research Coordinator makes personal visits to each practice before beginning the study. At this visit, all involved personnel review the study procedures. A special study manual has been developed to ensure consistency across practices and to help resolve any problems that might arise during the study period. In addition, the Research Coordinator contacts all practices one week after the orientation to confirm that the practices are following the study protocol and to solve any logistical problems that have arisen.

Problems Encountered: One significant problem encountered is the large amount of time it is taking for some practices to enter their required number of patients into the study. A large portion of this is due to the practice's patient load being high during the summer months. This resulted in a delay in entering patients. The problem is being alleviated now that the summer "crunch" is over. No other problems have been encountered at this time.

Significance of Study: Many primary care physicians want effective and practical methods to use to promote smoking cessation, particularly among certain at-risk patients such as those with chronic airflow obstruction or pregnant women. Though some promising work has been done by individual practices in isolated locations, no controlled studies on smoking cessation in a large number of primary care settings have been accomplished. The work planned by the COOP Project should produce important results with widespread generalizability.

2. Workplan for 1982-1983:

The workplan for the coming year involves completing the Fatigue Study, continuing work on the Smoking Cessation Study, and selecting a new study topic at the Annual Meeting scheduled for October, 1982 for protocol development and implementation

A Gantt Chart for research activities is shown on page 24.

E. Education:

1. Background:

The COOP seeks to engage in educational activities that can enable medical students, residents, and practicing physicians to become more knowledgeable about clinical cost-effectiveness, practice management, and how computerized medical information systems can improve medical care delivery. Education is an integral part of all COOP functions -- medical information system, management consultation, quality assurance, and research. Education is delivered in multiple ways -- feedback of data, personal consultations, group discussions, written material, and participation in COOP activities such as cost-effectiveness study protocol development and teaching medical students to be cost-consciousness.

2. Progress and Problems:

Loss of federal funding required us to scale back our education efforts. The main educational project was to conduct a cost-awareness program for Dartmouth Medical School students as part of their primary care clerkship. This education program used information produced by the Cross Practice Data Base and COOP physicians to provide tutorials for medical students doing clerkships in their practices. This is the second year that this program has been conducted. It has led to a strong and innovative approach for teaching cost-consciousness to medical students. The educational strategy has been presented at national meetings (e.g., Society of Teachers of Family Medicine, May, 1982) and will be further disseminated through a publication describing the program (see Exhibit 19).

Other educational activities conducted this past year include management audits, the Annual Meeting (which combined continuing education with COOP produced research findings), distribution and discussion of each practices Year-End Report containing intra-practice and inter-practice data, and publication of the COOP Newsletter several times per year.

3. Workplan for 1982-1983:

Next year's workplan for education will, of necessity, be modest. It involves the Annual Meeting, publication of the Newsletter, and improved feedback of information to COOP members from the Cross Practice Data Base. Because Dartmouth Medical School is converting from a three-year to four-year program, there will be no clerkships next year and, therefore, there will be a pause in continued development of the medical student cost-consciousness program. We will, however, use this opportunity to explore the feasibility of seeking new support to develop an education program for medical residency programs. The aim would be to use the new COOP computer system to teach residents how to: (1) practice cost-effective medicine, (2) manage their practices, (3) improve continuity of care, (4) establish a quality assurance system, and (5) perform practice-based research. This would require development of an educational "package" that would include an instructor's guide, resident workbooks for each topic, and appropriate computer software.

An education Gantt Chart is shown on page 25.

MEDICAL INFORMATION SYSTEM AND PRACTICE MANAGEMENT

September, 1982 - August, 1983

	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	S	O	N	D	J	F	M	A	M	J	J	A
I. Medical Information System												
A. Computer Hardware												
Install selected hardware into volunteer practices and conduct introductory training sessions (10 sites) (Maine sites #s 5,6,7,8)	#1,2	#3	#4	—	#5,6	#7,8	—	#9	—	#10	—	#11
B. Encounter Data												
1. Monitor completeness and accuracy of data entry	—	—	—	—	—	—	—	—	—	—	—	—
2. Evaluate Feedback Reports					—	—	—					
C. Revenue and Expense Data												
1. Monitor completeness and accuracy of data entry	—	—	—	—	—	—	—	—	—	—	—	—
2. Initial Feedback Reports		—										
3. Quarterly Reports						—			—			—
D. Marketing of Superbills to Non-COOP Sites	—	—	—	—	—	—	—	—	—	—	—	—

III. TIMETABLES FOR 1982-1983:

The following pages provide Gantt Charts for each functional area: (1) medical information system, (2) practice management, (3) quality assurance, (4) cost-effectiveness research, and (5) education.

MEDICAL INFORMATION SYSTEM AND PRACTICE MANAGEMENT (Continued)

	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	S	O	N	D	J	F	M	A	M	J	J	A
II. Practice Management												
A. Reactive: provide management consultation to practices in response to requests	—	—	—	—	—	—	—	—	—	—	—	—
B. Proactive: conduct structured management audits to COOP practices												
1. Management audits	—	—	—	—	—	—	—	—	—	—	—	—
C. Distribute indicator data on cost per unit of service and charge per patient per year			—			—			—			—
D. Draft detailed plan for COOP to achieve financial self-sufficiency by June, 1984				—	—	—	—					

QUALITY ASSURANCE
September, 1982 - August, 1983

	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	S	O	N	D	J	F	M	A	M	J	J	A
A. Continue to feed back quality assurance data												
B. Continue to provide technical assistance to practices upon request												
C. Refine the data system to provide more reliable and detailed clinical information to assist in quality assurance												
D. Investigate clinical audit approaches (such as Sanazzaro's and Palmer's) that allow better measurement of detailed clinical process.												

CLINICAL COST-EFFECTIVENESS
September, 1982 - August, 1983

	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	S	O	N	D	J	F	M	A	M	J	J	A
A. Charges Per Patient Feedback Reports												
1. Produce and distribute reports							—	—	—			
B. Fatigue Study												
1. Complete data collection	—	—										
2. Analyze data and draft paper		—	—	—	—	—	—					
3. Consider Intervention Study		—	—	—	—	—						
C. Smoking Study												
1. Enter patients into study	—	—	—									
2. Collect data	—	—	—	—	—	—	—	—	—	—	—	—
3. Analyze data and draft paper							—	—	—	—	—	—
D. Prospective Study of New Condition												
1. Select condition	—	—										
2. Draft research protocol			—	—	—	—						
3. Pre-test protocol							—	—	—			
4. Begin study										—	—	—

EDUCATION

September, 1982 - August, 1983

	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	S	O	N	D	J	F	M	A	M	J	J	A
A. Annual Meeting:												
1. Plan, conduct, and assess COOP Annual Meeting	—	—	—									
B. Newsletter												
1. Publish three times/year			—	—				—	—			
C. Data Feedback:												
1. Provide intra-practice and inter-practice feedback reports	—	—	—	—	—	—	—	—	—	—	—	—
2. Conduct individual practice discussions of data						—	—	—				
D. Explore development of educational program for medical residents that uses the COOP MIS to teach quality assurance, practice management, cost-effectiveness, and research methods for office practices.				—	—	—	—	—	—			

EXHIBIT 1

The Cooperative Information Project: Part 1: A Sentinal Practice Network for Service and Research in Primary Care

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This is the first of two papers describing the Primary Care Cooperative Information Project (COOP Project), a program that integrates the interests of community physicians, medical school faculty, and health policymakers. This integration has been accomplished through the uniting of 44 rural medical practices in Maine, New Hampshire, and Vermont with faculty at Dartmouth Medical School in clinical research, quality assurance, practice management, and continuing medical education activities. This paper describes the structure, goals, and history of the COOP Project, together with the design, cost, and output of its computerized medical information system.

The purpose of this two-part article is to describe a new program, the Primary Care Cooperative Information (COOP) Project. The COOP Project is an experimental program uniting community physicians, medical school faculty, and federal policymakers.

The core of the program is a medical information system that meets the fundamental data needs of individual rural practices. As a derivative, the medical information system produces a cross-practice data base that the medical school uses for outreach service programs in practice management, quality assurance, and continuing medical education. Medical school faculty and community physicians work together to use the medical information system to conduct clinical research and public policy oriented studies on quality of care, cost effectiveness, and cost containment.

This article describes the COOP Project objectives, outreach services, and research foci. In addition, this article discusses how 44 practices and two residency training programs use either a manual or computerized approach to contribute data to the cross-practice network, the multiple uses of the resulting information, and the associated costs of producing this information.

The Primary Care Cooperative Information Project

Overview

The Primary Care Cooperative Information Project consists of a network of 44 free-standing primary care practices that are working with med-

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ical school faculty to (1) establish a professional environment that can help attract, retain, and educate primary care physicians in a rural area, (2) develop practice based quality assurance systems, (3) improve management efficiency and heighten clinical cost consciousness in the daily practice of medicine, and (4) build a better system for continuing education based on practice self-study and cross-practice research.

The COOP Project was started in 1977 with 14 practices in New Hampshire and Vermont; 11 were private practices and 3 were community health centers that received government subsidies. Since that time, the network has grown to include 23 practices in New Hampshire and Vermont, and 21 in Maine. Eighteen sites are private practices, and 26 are community sponsored, federally subsidized health centers. Two additional sites are residency training programs in family medicine and pediatrics. The practices are staffed by 76 physicians and 27 physicians' assistants and nurse practitioners; they average 28,000 visits per month. The "hub" of the network is Dartmouth Medical School, part of the Dartmouth-Hitchcock Medical Center.

Medical Information System

Central to each of the goals of the COOP Project is a medical information system that is a permanent feature of each practice in the network. The medical information system is not an add-on data collection effort. It is being constructed as an integral part of each practice's patient encounter, billing, accounts receivable, and general ledger system.

The core of the COOP Project is development of a medical information system in all practices that is tailored to the requirements of each, yet contains a basic data set common to all participants in the network. The basic data set captured in each practice has been collected since November 1978 through the mailing of encounter forms to Dartmouth, where the information is keypunched and put on a mainframe computer. The medical information system currently "captures" compatible patient encounter data on 28,000 visits per month. The average data processing cost per physician per year for the batch method is approximately $1,440. In July 1980 five practices started to collect information "automatically" by entering data into a microcomputer, located in their practice, that is linked to a mainframe computer.* The computerized system, in addition to capturing the minimum data set, automates billing and accounts receivable procedures.

Services to the Practices

By combining the data base generated by the medical information system with medical school faculty with the relevant expertise, the COOP Project provides a four-part package of services to practices: (1) clinical and management feedback reports, (2) practice management consultation, (3) quality assurance technical assistance, and (4) continuing medical education and primary care research opportunities. The four elements of the services are described as follows.

Clinical and Management Feedback Reports

Each practice receives standard monthly management (utilization, productivity, charges) and quarterly clinical (diagnostic index, age-sex registers, patient call-back lists) feedback reports. There are two sets of feedback reports. Intrapractice reports provide a quantitative picture of within practice longitudinal trends; interpractice reports provide each practice and each physician with a statistical analysis of individual standing or ranking within the entire group.

Reports of special interests to practices are available upon request,** and sites with external reporting requirements (such as those with government subsidies) receive tailored data that help them meet their reporting requirements.

Practice Management Consultation

A highly qualified practice management specialist assists the practices in developing financial data systems that meet individual needs and are compatible with other sites. The management consultant works directly with the practices, making use of the feedback reports, to increase management efficiency, hold down operating costs, and provide ad hoc consultation. He gains knowledge of each practice's strengths and weaknesses over time and is thereby capable of making recommendations and monitoring progress.

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*The manual data collection system is designed to integrate with pegboard billing and accounts receivable (A/R) systems used by most small practices. The computerized data collection system is designed to replace the manual pegboard systems and automates the billing and A/R functions.

**An example of a special request report involved the Selacryn recall, a drug used for treatment of hypertensives that was found to have dangerous side effects. In this case, practices using Selacryn requested listings of all hypertensive patients.

The management consultant coordinates cross-practice management research. Studies have been conducted on (1) total operating costs, (2) expenses associated with transition to a computerized medical information system, (3) the accuracy of administrative data, and (4) number of active patients in practices' panels.

Quality Assurance Technical Assistance

A consultant in quality assurance works with each practice that wishes to develop an ongoing system for medical care assessment. The specialist helps each site set quality assurance goals that reflect its principles of practice and assists them with planning, executing, assessing results, and repeating the cycle. The emphasis is on using quality assurance as an education medium for practice self-analysis and on the development of practical assessment protocols that small practices are able and willing to institute on a long-term basis.

Continuing Medical Education and Primary Care Research

The COOP Project holds several meetings each year. The meetings are designed to blend continuing education with cross-practice research.* During these meetings, alternative clinical and management study ideas are presented, a vote is taken to decide which topic to focus on for interpractice research, and a subcommittee of community and medical school faculty is formed to draft a protocol and oversee data collection. The results of the preceding study are distributed and discussed, and set the stage for a formal educational presentation related to the results. Participants receive Category 1 Continuing Medical Education credits, at no charge, for attending the meetings. In addition to the educational ramifications of quality assurance and primary care research activities, there is a standing Continuing Medical Education Committee that assesses the educational interests of primary care physicians and relates them to educational opportunities within the region. The Continuing Medical Education Committee serves as a planning and lobbying force to promote relevant primary care oriented learning experiences.

In return for this package of services, each practice agrees to (1) develop compatible encounter and financial systems, (2) purchase special data collection forms and use office staff to complete the forms and submit them in accordance with set control procedures, (3) participate in cross-practice clinical cost effectiveness and practice management research, and (4) attend all COOP Project meetings-of-the-whole.

COOP Medical Information System

As indicated above, the core of the COOP Project is the development of an integrated medical information system that is tailored to the requirements of individual practices, yet contains a basic data set common to all participants. It is constructed as an integral part of each practice's clinical and administrative systems. Patient encounter data are collected via an encounter form. The encounter data are entered directly into the Dartmouth computer by a batch system or indirectly through a microprocessor. Practice revenue and expense data are submitted monthly by all practices on a batch basis. Three weeks after the close of each month, encounter data feedback reports are produced and mailed to each practice. More extensive reports are produced on a quarterly and year-end basis.

Source Documents

The integrated medical information system includes two categories of data: (1) patient encounter data on each visit registered in all locations (office, hospital, nursing home, patient's home) and (2) expense and accounts receivable data.

The first category of information, patient encounter data, is gathered on compatible encounter forms called "Superbills." The Superbill is an encounter form that is also acceptable as a bill by many insurance companies. (In New Hampshire and Vermont these companies include Blue Cross and Blue Shield, Connecticut General, and Medicare when attached to Part I.) In fact, all Superbill design features and modifications have been worked out with Blue Shield staff. A sample Superbill is shown in Figure 1. The data set consists of the following variables: practice identification, clinician identification, date of visit, location of

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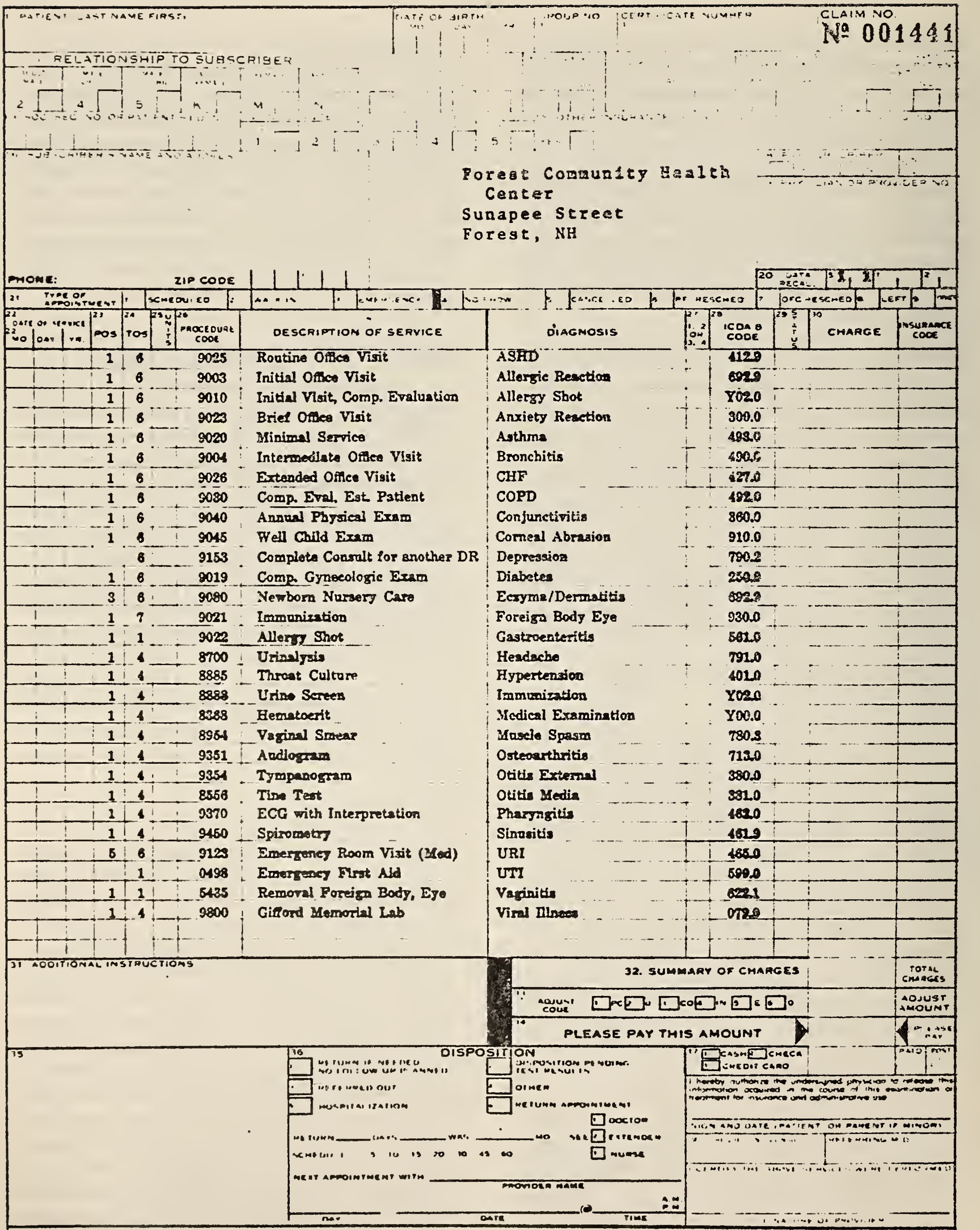
*Agendas of COOP meetings are available on request.



1 PATIENT (LAST NAME FIRST) | DATE OF BIRTH | GROUP NO | CERTIFICATE NUMBER | CLAIM NO. **№ 001441**

RELATIONSHIP TO SUBSCRIBER

Forest Community Health
Center
Sunapee Street
Forest, NH

PHONE: ZIP CODE

21 TYPE OF APPOINTMENT | 1 SCHEDULED | 2 WALK IN | 3 EMERGENCY | 4 NO SHOW | 5 CANCELLED | 6 PT RESCHED | 7 OFC RESCHED | 8 LEFT | 9

22 DATE OF SERVICE MO	DAY	YR.	23 POS	24 TOS	25 UNITS	26 PROCEDURE CODE	DESCRIPTION OF SERVICE	DIAGNOSIS	27 1, 2 OR 3, 4	28 ICDA 8 CODE	29 STATUS	30 CHARGE	INSURANCE CODE
			1	6		9025	Routine Office Visit	ASHD		412.9			
			1	6		9003	Initial Office Visit	Allergic Reaction		692.9			
			1	6		9010	Initial Visit, Comp. Evaluation	Allergy Shot		Y02.0			
			1	6		9023	Brief Office Visit	Anxiety Reaction		300.0			
			1	6		9020	Minimal Service	Asthma		493.0			
			1	6		9004	Intermediate Office Visit	Bronchitis		490.0			
			1	6		9026	Extended Office Visit	CHF		427.0			
			1	6		9030	Comp. Eval. Est. Patient	COPD		492.0			
			1	6		9040	Annual Physical Exam	Conjunctivitis		360.0			
			1	6		9045	Well Child Exam	Corneal Abrasion		910.0			
				6		9153	Complete Consult for another DR	Depression		790.2			
			1	6		9019	Comp. Gynecologic Exam	Diabetes		250.9			
			3	6		9080	Newborn Nursery Care	Eczyma/Dermatitis		692.9			
			1	7		9021	Immunization	Foreign Body Eye		930.0			
			1	1		9022	Allergy Shot	Gastroenteritis		561.0			
			1	4		8700	Urinalysis	Headache		791.0			
			1	4		8885	Throat Culture	Hypertension		401.0			
			1	4		8388	Urine Screen	Immunization		Y02.0			
			1	4		8368	Hematocrit	Medical Examination		Y00.0			
			1	4		8964	Vaginal Smear	Muscle Spasm		780.3			
			1	4		9351	Audiogram	Osteoarthritis		713.0			
			1	4		9354	Tympanogram	Otitis External		380.0			
			1	4		8556	Tine Test	Otitis Media		381.0			
			1	4		9370	ECG with Interpretation	Pharyngitis		462.0			
			1	4		9450	Spirometry	Sinusitis		461.9			
			5	6		9123	Emergency Room Visit (Med)	URI		465.0			
				1		0498	Emergency First Aid	UTI		599.0			
			1	1		5435	Removal Foreign Body, Eye	Vaginitis		622.1			
			1	4		9800	Gifford Memorial Lab	Viral Illness		072.9			

31 ADDITIONAL INSTRUCTIONS

32. SUMMARY OF CHARGES | TOTAL CHARGES

ADJUST CODE ☐ PC ☐ ☐ CO ☐ ☐ ☐ | ADJUST AMOUNT

PLEASE PAY THIS AMOUNT

16 DISPOSITION

☐ RETURN IF NEEDED NO FOLLOW UP PLANNED
☐ DISPOSITION PENDING TEST RESULTS
☐ REFERRED OUT
☐ OTHER
☐ HOSPITALIZATION
☐ RETURN APPOINTMENT
☐ DOCTOR
☐ EXTENDER
☐ NURSE

RETURN ____ DAYS ____ WKS ____ MO SEE

SCHEDULE 5 10 15 20 30 45 60

NEXT APPOINTMENT WITH ____________ PROVIDER NAME

DAY ____ DATE ____ @ ____ A.M. P.M. TIME

17 ☐ CASH ☐ CHECK ☐ CREDIT CARD | PAID | POST

I hereby authorize the undersigned physician to release the information acquired in the course of this examination or treatment for insurance and administrative use.

SIGN AND DATE (PATIENT OR PARENT IF MINOR)

REFERRING M.D.

Figure 1. Sample "Superbill" used for collecting encounter data

visit, patient identification,* new or old patient to practice, patient date of birth, patient sex, patient ZIP code, all diagnoses treated, all procedures performed, charges, disposition, appointment status, expected source of payment, adjustments to charges, payment received, and data for special studies.** While the basic form is identical across the practices, diagnoses and procedures are crash imprinted on an individual practice basis, allowing for some variations by specialty, location, or preference. (Approximately one half of all diagnoses and procedures are standardized.) The Superbills are purchased in bulk by Dartmouth and distributed to the practices at 7 cents per form. Typically, practice clerical staff complete the top portion of the document, the clinician checks the appropriate procedure codes, diagnoses, and disposition at the end of the visit, and clerical staff complete the coding by listing charges and scheduling return visits. The top copy of the Superbill is sent to the patient's insurance company, if assignment is accepted, or it is given to the patient as a statement. The patients may then submit the form copy to their insurance company. The second copy is batched and mailed to Dartmouth on a weekly basis. The third copy can be included in the medical record. Those practices using the microprocessor terminal do not batch and mail copies of the Superbill, but enter Superbill data directly into the microprocessor.

Use of Superbills has both advantages and disadvantages. The principal advantage is that they streamline the billing process for many accounts by reducing duplicate recording of information. It follows that since the Superbill is the basic billing document, the data accuracy and completeness are generally high. Between October and December 1980 the completeness rate for procedures varied from 99 to 100 percent; for patient's birthdate, the completeness rate varied from 97 to 100 percent. The main disadvantage of the Superbill involves accurate coding of diagnoses and procedures. When it functions as the bill given to the patient, there may be inaccurate coding of sensitive diagnoses (eg, venereal disease, schizophrenia, alcoholism). Because the Superbill is most frequently sent to an insurance company, there may be undercoding of nonreimbursable problems (eg, marital counseling, family planning) or procedures. Finally, the preprinting of common procedures and diagnoses, while facilitating their recording, may also result in a "forcing" phenomenon in which the closest preprinted diagnosis is selected rather than writing out the true diagnosis. A validity study in five practices comparing the Superbill diagnosis to the medical record diagnosis yielded an average discrepancy rate of 5 percent.

The second category of information, involving practice revenues and expenses, is gathered once per month. Data related to revenues and information on operating expenses are summarized on monthly worksheets that incorporate uniform definitions and categories. This allows collection of comparable information across the practices on the following accounting variables: revenues (gross receipts, refunds, net receipts, and collection ratio) and expenses (personnel, office overhead, supplies, equipment, insurance, and bad debt). The expense categories correspond to those contained in Internal Revenue Service Form 1040, Schedule C. The vast majority of the practices in the COOP Project file Schedule C with their tax returns; thus their accounting system is structured to meet its requirements. Accordingly, using those expense categories minimizes clerical effort for the practices and circumvents definitional problems arising from the adoption of a newly created chart of accounts.

Data Entry

The COOP Project has two different methods for entering data from practices in the network and two input documents (Superbills, and monthly worksheets on revenues and expenses). One method for entering Superbill data involves a service bureau approach, and the other, a distributed microcomputer strategy which is integrated with the practice's billing process. All revenues and expenses are entered on a service bureau basis. Figure 2 depicts the overall flow of data through the medical information system.

The majority of practices (37) use the service

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*For confidentiality purposes and generalizability across practices, the Hogben code has been adopted as the patient identifier (ie, first four digits of last name, initial of first name, and birth date).

**A small space in the lower left-hand corner of the Superbill is reserved for additional data items desired on a short-term basis for special clinical studies. A stamp is made with the appropriate data elements and imprinted on all Superbills used during the study period. For example, in a recent study on the use of antibiotics, the particular drug used, the length of time prescribed, and the mode of administration were recorded in this space.

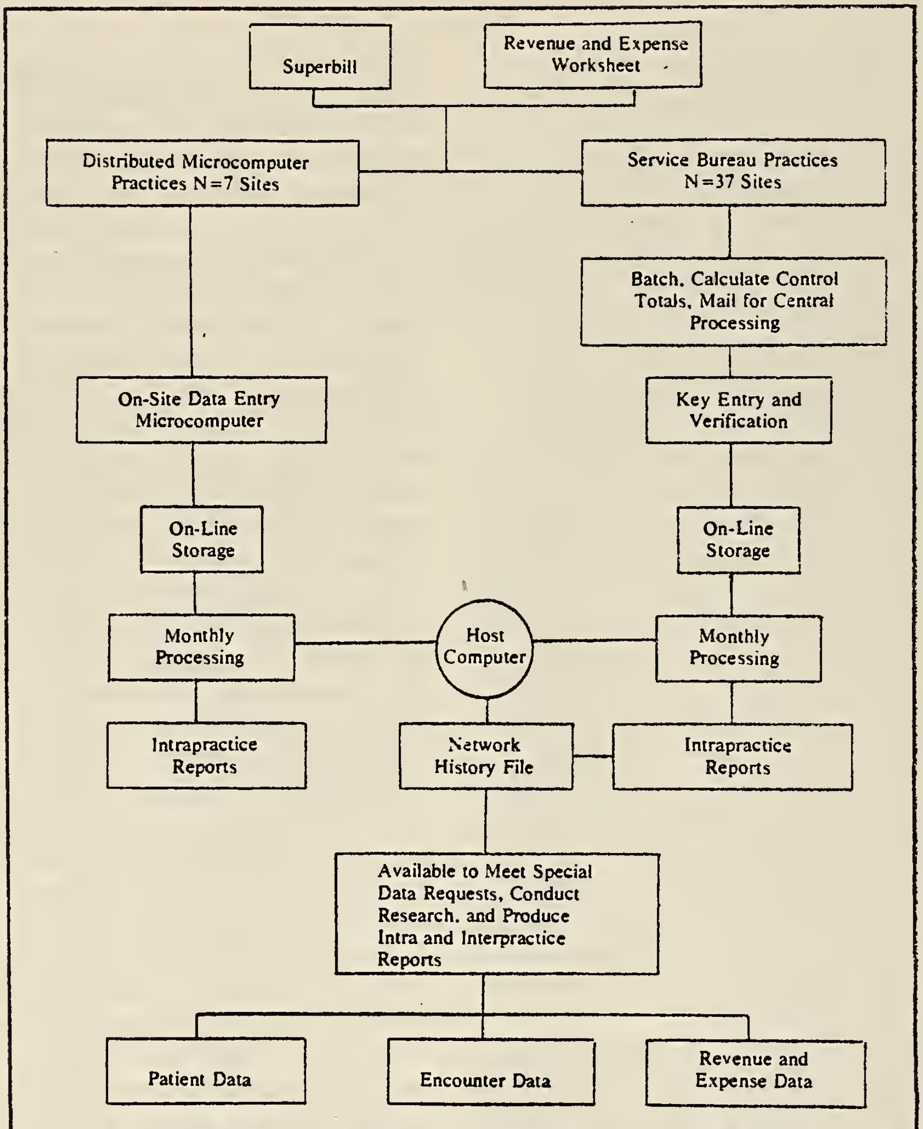
Superbill
Revenue and Expense Worksheet
Distributed Microcomputer Practices N=7 Sites
Service Bureau Practices N=37 Sites
Batch, Calculate Control Totals, Mail for Central Processing
On-Site Data Entry Microcomputer
Key Entry and Verification
On-Line Storage
On-Line Storage
Monthly Processing
Host Computer
Monthly Processing
Intrapractice Reports
Network History File
Intrapractice Reports
Available to Meet Special Data Requests, Conduct Research, and Produce Intra and Interpractice Reports
Patient Data
Encounter Data
Revenue and Expense Data

Figure 2. COOP medical information system: Data flow diagram

bureau approach for Superbill data. Practice staff assemble the Superbills in batches, calculate control figures (on charges and number of visits) for batches of Superbills, and mail the Superbills weekly, and the worksheet on revenues and expenses monthly, to Dartmouth for data entry, storage, and report generation. Special colored, prelabeled, and reusable mailers are provided for this purpose. All data are processed through a strict verification program, and the final data set is reconciled with the practice's control figures. The data are entered in a format that can be used directly by a comprehensive data base manager. All personnel involved in entering and processing the data sign confidentiality documents, and data access and storage are carefully protected.

Seven practices currently use the distributed microcomputer approach. These practices were either too large to continue using their manual billing system or were interested in experimenting with a computerized billing system. Dartmouth had conducted a national search to determine the most cost effective commercial billing system for small rural practices which could also collect the entire COOP Project data base. A company was selected, and the seven aforementioned COOP Project practices reviewed the costs and performance of the billing system and decided to adopt the system. Each of the seven practices has a microcomputer in its office. Practice staff enter Superbill data directly into the microcomputer terminal. The microcomputer stores the data entered that day. During the night following each working day, the host computer places an automatic phone call to the practice's microcomputer and (1) receives the information stored during the day and enters it into the memory of the host computer, and (2) updates the information stored in the microcomputer's memory regarding patients' outstanding balances. (The phone call averages 20 seconds.) The actual bills and past-due account notices are sent directly to the patients every month from the host computer location. Every three months all transaction files collected by the microcomputer system are put on magnetic tape and mailed to Dartmouth for reformatting and inclusion in the central COOP Project data base.

Both the service bureau and distributed microcomputer methods enable the network to capture the same basic data set for use in practice management, quality assurance, continuing education, and research. The main difference between the two approaches is that practices with microcomputers can automate the billing, collections, and bookkeeping functions that service bureau practices continue to perform manually. A controlled study is currently being conducted in five practices to measure the impact of the computerized system on collection rates and age of accounts receivable, distribution of staff time, staff attitudes, patient inquiries, and insurance turnaround time. These results will be available in the fall of 1981.

Expense and revenue data are entered monthly by COOP Project staff into an interactive data base manager designed for accounting purposes. This allows accounting data from each practice to be stored centrally using uniform categories for revenues and expenses.

Feedback Reports

Both service bureau and microcomputer practices receive a monthly administrative report. The service bureau report is mailed to each practice no later than three weeks after the close of each month. It includes the number of patient visits and gross charges registered by each practitioner in each visit location, number of new patient visits, percentage of self-pay charges collected at time of visit, and percentage of charges sent to third party payors. The microcomputer practices (which use the computer to automate monthly billing, aging of accounts, and some bookkeeping functions) receive a standard package of billing reports, which includes (1) a transaction control report that documents the daily charge/receipts of the practice, (2) an account activity report that shows monthly and year-to-date charges and receipts on all open accounts by date and type of service, and (3) an overdue account analysis that indicates the name and telephone number of patients with balances due by age of charge.

All practices receive quarterly intrapractice feedback reports that document (for each clinician individually and the practices as a whole) (1) production: total number of visits, days worked, unscheduled visits, total number of patients, number of new patients and charge information; (2) patient characteristics: age, sex, town of residence, primary insurance coverage, and diagnosis; and (3) encounter characteristics: type of appointment, procedure frequency and charges, and disposition of patient. A special software package exists for approximately one half of the practices that are federally supported health centers. These practices receive tables and patient lists for all patients meeting the "clinical indicators" criteria. This facilitates the completion of their federal reporting requirements every quarter. Such data include hospital admissions by specialty, family planning utilization by age group, and patients with Pap tests for review of follow-up.

In addition to the routine monthly and quarterly reports, practices are encouraged, through individual and group meetings with COOP Project staff, to request data which may be of use for either clinical or management purposes. Most frequent requests involve patient recall lists for patients meeting specified criteria (eg, elderly patients with respiratory problems for influenza shots, or pediatric patients turning two years of age to review immunization status). Other examples of data requests are age and revisit rates of new patients, total laboratory charges by clinician, and patients with hypertension subsequent to the Selacryn drug recall. In the past eight months, 67 requests have been processed. Because all data have been stored in a data base manager format, most of these requests can be processed by a research assistant with no programming experience.

The capacity to produce interpractice reports is the hallmark of the COOP Project. These reports allow each practice and each clinician to observe his standing within the entire group, by specialty, or by practice organization. For example, specific comparisons can be made across practices for type of visit, fees for selected procedures, visit frequency for specific chronic conditions, and costs per visit. Interpractice reports can be requested by a practice. In that case the COOP Project confidentiality policy stipulates that only ranges will be released unless written permission is received by each directly or indirectly (eg, specialty mix, patient residence) identified practice. COOP Project staff work on a regular basis with practice administrators and clinicians to point out trend indicators in the routine reports, deviations from practice objectives (eg, too few preventive services), and suggestions for both intrapractice and interpractice data requests.

Cost of the Medical Information System

From the beginning the COOP Project aimed to develop a cross-practice data system that would collect clinical and financial data in an ongoing manner at a reasonable cost. The program will be a failure if a medical information system is developed that costs more than mainstream practices are willing to pay. The goal has not been to develop the most comprehensive computerized medical information system. Rather, the aim has been to construct a multipurpose medical information system that a majority of practices will want to use for themselves and that facilitates interpractice cooperation on research and education.

The operating costs of the batch medical information system are approximately 30 cents per Superbill; 70 percent is for data entry and verification and 30 percent is for computer time and personnel time used in report generation. For physicians seeing approximately 400 patients per month (only one Superbill is completed for hospital services provided to a patient) this cost totals $120. For practices using the microcomputer, the cost incurred by the COOP Project is less because the practice is responsible for data entry, although some additional computer time for data reformatting is required. The actual charge to a solo physician for the commercial billing system is approximately $3,500 for the purchase and installation of the microprocessor plus a $150 per month service fee for subsequent months.

Discussion

The COOP Project is based on four premises regarding (1) control of the project, (2) role of an integrated information system, (3) medical school outreach, and (4) voluntary (vs regulatory) strategies. The first premise is that the COOP Project aims to meet the educational, managerial, and research interests of primary care physicians. It is a collaborative effort involving a medical school, community practices, and policymakers, but the direction of the COOP Project is determined by interest of the physicians. Medical school based personnel "staff" key positions in the program and coordinate activities, but representatives from the practices and the group as a whole vote on what activities should be emphasized. The medical director of the COOP Project is a general internist practicing full time in a rural community.

The second assumption is that the multiple functions of the COOP Project can best be promoted by development of a computerized interpractice data network. The intent is to construct an integrated, multipurpose medical information system that helps practices to perform routine management tasks and enables each physician to observe his rank within the group on quantitative indicators of clinical and managerial performance. The medical information system should enable reliable data capture as well as aggregation of data across practices and over time and should be efficient to maintain after developmental costs have been expended.

The third premise is that medical schools have a regional responsibility to foster a professional environment that helps communities recruit and retain well-trained primary care physicians. Parker and Sorenson studied the reasons for physicians' decisions to settle in and leave rural communities. They concluded that the major reason for departing "seems to stem chiefly from an unsatisfactory professional situation," while the main reasons for selecting an area related to "good professional support, especially a good community hospital, a nearby tertiary medical center, and medical consultants in various fields."[1] The COOP Project is implementing programs like those suggested by Parker and Sorenson to improve the health care system.

The fourth premise is that policymakers should consider testing the effectiveness of a voluntary, decentralized, physician instigated approach to quality assurance and cost containment. In the United States, policymakers have adopted regulatory approaches for quality assurance and cost containment and are using a subsidy strategy to improve access to care in physician shortage areas. These regulatory and subsidy approaches may be less effective than market oriented strategies that use competition, information, and education to contain costs, improve access, and assure quality.[2-8] Therefore, the COOP Project hopes to promote competition by using cross-practice information (showing each practice its relative management efficiency and clinical cost effectiveness) coupled with a unique brand of continuing education (promoting discussion of the cross-practice clinical and management information with other physicians and outside experts) and mounting programs to improve weaknesses that are identified.

The development of the regional data network is currently being supported by the practices, Dartmouth, and special grants. Plans are being made to make the network substantially self-sufficient by 1984. To accomplish this, the costs of the data system must be as low as possible and must be shifted fully to the practices themselves and to other users of the data. The first step in making the data system as efficient and useful as possible to the practices has been the integration of a practice billing system into the data network.

The data network concept pursued by the COOP Project appears to be the most cost effective organization allowing small medical practices to utilize a medical information system at this stage of computer technology. The clinical and management benefits of an in-house comprehensive system such as Co-Star, which has been developed by the Laboratory of Computer Science at the Massachusetts General Hospital ($2.76 per encounter for a practice with 55,000 encounters per year),[9] are not affordable by small practices. Moreover, the interpractice comparisons and the consultative resources of a central organization for clinical research, statistical analysis, and management applications would not be available. At this moment, COOP Project practices are more interested in focused interpractice comparisons and collaborative clinical research than in computerized medical records, automated flow charts, and other uses of the computer to assist medical practice. Similar conclusions have been reached by the M/POP Project in Colorado, where the costs of a similar system for small practices are $1.17 to $1.61 per encounter,[10] and a commissioned study in England.[11] The ultimate viability and self-sufficiency of the data network will be boosted if it can be demonstrated that an integrated (management plus clinical data) approach with an umbrella service organization will produce useful and affordable data for participating practices and outside users.

In conclusion, while the medical information system is the most visible aspect of the COOP Project, the COOP Project is more than a data network. It provides services to practices and opens up new opportunities for primary care research, medical audit, and continuing education based on quantitative practice self-analysis.

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The Cooperative Information Project: Part 2: Some Initial Clinical, Quality Assurance, and Practice Management Studies

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Many of the obstacles inherent in the conduct of primary care research have been overcome by an experimental program in northern New England, the Primary Care Cooperative Information Project. This project uses a medical information network in 44 rural medical practices to carry out both clinical and management research. This paper describes the developmental problems encountered and the results of some initial clinical, quality assurance, and practice management studies conducted by the network and presents observations on its future research directions.

Since the 1960s, there has been a great awakening of interest in "primary" medical care. One measure of this interest has been the development of family medicine and the shift in internal medicine and pediatrics toward general, rather than specialty, training. However, it has become increasingly clear that development of the scientific foundation for general medicine has not kept pace with the political interest, rhetoric, and proliferation of trainees.[1] With this realization has come substantial progress in making primary care medicine a legitimate scientific discipline, complete with its own textbooks, medical journals, and fledgling research societies.

However, there are obstacles to scientific study that are inherent in the organizational structure of primary care medicine (ie, many scattered small units) and in the character of the illness episodes which constitute its practice (ie, extremely broad spectrum, ambulatory, variable natural history, chronic, and nonspecific outcomes). Clinical investigators now recognize that one important way to surmount these research obstacles is to establish ongoing regional data networks—"sentinel practice" networks—that link many individual primary care practices through shared information systems.[2] Several such networks are in various stages of development.[3-5] This paper presents the results from the initial clinical, quality assurance, and practice management studies conducted by the Primary Care Cooperative Information Project

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(COOP Project) in the course of developing a regional primary care information system. Presentation of the studies will enable the reader to observe (1) the tactics used to build the network, (2) the value and limitations of the work completed to date, and (3) the great potential for further development.

Three Clinical Studies

Hypertension Study

The first clinical study focused on hypertension treatment and screening. This was a pilot study to determine the feasibility of doing interpractice studies and to determine if the results were of value to the physicians. The charts of 231 hypertensive patients from 14 practices were reviewed retrospectively by a trained research assistant who recorded age, sex, pretreatment blood pressure, current blood pressure, laboratory tests within the past 18 months, medication regimen, nondrug treatment modalities, and number of months until next appointment. Data were similarly collected on 263 nonhypertensive adults, indicating the date on which a blood pressure was last taken, the blood pressure level, and follow-up actions for patients with elevated blood pressures.

The aim was to spark interest in collaborative work by proving that clinically relevant discussions could be triggered by simple descriptive studies that showed each practice where it stood within the group. The results indicated that in 11 of the 14 practices patients had diastolic blood pressures averaging less than or equal to 90 mmHg (Table 1). Pretreatment diastolic blood pressures averaged more than 100 mmHg (19 percent of patients had levels above 110 mmHg); posttreatment levels averaged 88 mmHg, with a range among the practices from 81 to 96 mmHg.

The data suggest there is considerable variation in both the case-mix and clinical approaches. The median age of hypertensive patients within a practice ranged from 54 to 68 years, percentage of women ranged from 0 to 79 percent, and the proportion with "significant" comorbidity (ie, another chronic disease for which medication was prescribed) varied from 23 to 61 percent. It appears that different physicians may have been treating to different goal blood pressures. For example, patients from practices D, G, and J achieved lowest mean blood pressures, while patients from practices F, H, and L registered the highest levels. The average diastolic blood pressure classed "acceptable" in medical record notes for the former set of practices was 82 mmHg, while the patients categorized as "acceptable" in the latter group averaged 87 mmHg. Some practices had similar case-mixes, such as C and D, and G and N, but they contrasted sharply on blood pressure outcomes (90 mmHg vs 81 mmHg in pair C and D) or on treatment process (53 vs 0 percent of patients under treatment for hypertension, but without medication prescribed in pair G and N). Other variations in treatment process were observed in these areas: percent of patients with two or more medications mentioned as part of the regimen (7 to 55 percent), the frequency of performing common laboratory tests, such as creatinine or blood urea nitrogen, within the 18 months preceding the index visit (38 to 100 percent), and median months until next appointment (one to three months). Data regarding drug of choice revealed that every practice used a diuretic such as hydrochlorothiazide as the first drug of choice. However, there was considerable variation on preferences for second line medications. Four practices used propranolol, four used methyldopa, and seven used other preparations. Choice of second line drug was not correlated with level of blood pressure pretreatment, posttreatment, age, or comorbidity.

Hypertension screening results indicated that 6 of the 14 practices screened 90 percent of their patients; another 6 checked blood pressures of 75 to 89 percent of their patients. Only two practices screened fewer than 75 percent of nonhypertensive adults. Of the 263 screened, a total of 27 (10 percent) had borderline elevations (ie, 90-95/150-165 mmHg) and 7 (3 percent) had elevated pressures (ie, > 95/165 mmHg). Medical record notes did not indicate that follow-up was scheduled for these patients with borderline or elevated blood pressures.

Antibiotic Usage Study

The second clinical study was a prospective study on antibiotics. Study objectives were to (1) describe patterns of antibiotic prescribing by diagnosis, (2) develop a continuing education program based on the findings, and (3) produce ideas for a follow-up clinical study on a particular diagnosis

Table 1. Hypertension Treatment Variables by Practice (percent)

Variables	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Outcomes														
Mean posttreatment diastolic blood pressure (mmHg)	84	88	90	81	89	93	82	96	90	81	90	93	88	86
Mean diastolic blood pressure of patients classed "acceptable" by physician (mmHg)	82	86	NA	82	90	87	81	92	88	82	NA	83	NA	NA*
Processes														
Percent of patients by number of medicines prescribed														
None	10	8	15	5	8	5	53	0	7	22	0	15	23	0
1	50	33	65	55	38	40	40	39	43	50	88	35	46	75
2	40	38	20	40	54	55	7	61	50	28	12	50	31	25
Percent of patients with other treatments noted (eg, reduce weight, modify diet)	50	33	35	23	30	40	22	7	33	50	30	30	21	10
Percent of patients with laboratory work during 18 months preceding index visit														
Creatinine-BUN	50	100	65	75	77	70	53	44	93	56	38	100	46	60
Urinalysis	45	100	20	25	77	30	40	6	43	56	38	90	31	50
Potassium	45	50	75	75	23	80	13	50	79	72	50	100	54	50
Median number of months until next appointment	2	3	1	1	2	1	3	2	1	3	1	3	2	2
Case-mix														
Median age (years)	57	59	60	58	64	60	68	60	62	55	60	54	60	64
Percent female	60	67	65	55	77	50	53	67	79	67	63	0	62	55
Percent of patients with other significant chronic diagnoses	45	33	25	25	23	35	27	39	29	61	25	35	25	25

*NA denotes "not ascertained"

or condition. Antibiotic prescribing behavior was selected by COOP Project physicians through majority vote because of its importance in primary care and the paucity of literature on the subject. Data were collected for a study period lasting four to six weeks on the compatible encounter forms used throughout the network. In addition to the basic data set captured routinely on all visits, information on four variables was collected: (1) antibiotic use that visit, (2) name of drug, (3) mode of administration (ie, parenteral, topical, oral), and if oral, (4) duration of treatment.

The results showed that antibiotics were used in 10 percent of office visits. The proportion of visits resulting in antibiotic use among the practices ranged from 6 to 18 percent of office visits. Table 2 lists, in rank order, the ten diagnoses most frequently associated with antibiotic treatment and the first and second drug of choice. The five most frequent illness episodes treated with antibiotics were, in rank order, otitis media, chronic bronchitis, pharyngitis/upper respiratory infection, dermatologic conditions, and urinary tract infection/cystitis.

Table 3 suggests that different physicians treat similar types of patients in a different manner. For example, 68 percent of all otitis media episodes in children under six years of age resulted in antibiotic use. The range among clinicians on antibiotic use rate was 30 to 84 percent of episodes. Similarly, 71 percent of bronchitis episodes in patients under 45 years of age resulted in antibiotic therapy, but the range across practitioners was 67 to

Table 2. Most Common Diagnoses Resulting in Antibiotic Treatment: All Patients with No Relevant Comorbidity

Condition	ICDA Code(s)	Number with Treatment	First Drug of Choice (%)	Second Drug of Choice (%)
Otitis media	381	288		
Under 6 years		174	Ampicillin (80)	Penicillin (7)
6 years plus		114	Penicillin (53)	Ampicillin (28)
Bronchitis	466, 490, 491	161		
Under 45 years		92	Ampicillin (37)	Tetracycline (27)
45 years plus		67	Tetracycline (49)	Ampicillin (25)
Upper Respiratory Infection		136		
Unspecified	465	33	Penicillin (73)	Erythromycin (9)
Streptococcus	034	39	Penicillin (90)	Erythromycin (4)
Tonsillitis	463	27	Penicillin (81)	Erythromycin (15)
Pharyngitis	462	37	Penicillin (78)	Erythromycin (6)
Dermatologic problems		130		
Abscess	682	76	Penicillin (32)	Erythromycin (22)
Impetigo	684	24	Penicillin (50)	Erythromycin (33)
Dermatitis	692	21	Penicillin (24)	Topical (24)
Acne	706	9	Tetracycline (63)	Erythromycin (25)
Urinary Tract Infection/Cystitis	595, 599	68		
Under 12 years		6	Sulfa (50)	Sulfa plus (50)
12 years plus		62	Sulfa plus (32)	Sulfa (26)
Sinusitis		58		
Acute	461	39	Ampicillin (46)	Erythromycin (21)
Chronic	503	19	Erythromycin (42)	Penicillin (21)
Pneumonia	486	53	Erythromycin (57)	Ampicillin (17)
Vaginitis	622	46	Other (35)	Antitrichimonad (26)
Conjunctivitis	360	41	Sulfa (44)	Topical (29)
Pelvic Inflammatory Disease	616	21	Ampicillin (67)	Tetracycline (24)

100 percent. In general, there was high comparability on the duration for which antibiotics were prescribed, even for a diagnosis such as urinary tract infections/cystitis, where recent studies suggest that a short course of treatment may be as effective as the traditional 10- to 14-day regimen.[6,7]

Case-Mix Variations

The capacity to produce interpractice reports and to do cross-practice studies is one unique aspect of the program. An example of an interpractice report on case-mix variations is shown in Table 4, which includes findings on the diagnoses, age, sex, and disposition of visit occurring in the practices of 12 family physicians and 14 general internists (total visits = 28,258). Larger proportions of young patients were seen by the family physicians (8 percent vs 6 percent for ages 5 to 12 years) while more aged populations were served by internists (24 percent vs 12 percent aged 65 years or older). The percent of visits made to family physicians by females was 9 percent higher than the proportion for internists. The percentage of visits for upper respiratory infections was similar among family physicians and internists (10 per-

Table 3. Antibiotic Use Rate and Drug Choice by Provider for Selected Diagnoses

Diagnosis	Number of Episodes with Treatment	All Providers: Percent Episodes with Treatment	Across Providers: Range in Percent Episodes Treated*		Across Providers: Range in Number of Days of Duration	
			High	Low	High	Low
Otitis media						
Under 6 years	174	68	84	30	10	10
6 years plus	114	45	100	33	10	7
Bronchitis						
Under 45 years	92	71	100	67	10	5
45 years plus	67	85	100	75	10	7
Urinary tract infection/cystitis						
12 years plus	62	71	83	50	14	10

Note: Analyses are based on illness episodes with no comorbidity for diseases commonly requiring antibiotics (ie, patients with both otitis media and upper respiratory infections were excluded). Illness episodes were defined as an index visit plus any subsequent visits with the same diagnosis occurring within a three-week period.
*Providers with less than five treatment episodes were excluded from the analysis.

Table 4. Case-Mix Variations Among COOP Project Practices By Physician Specialty

Variable	Family Medicine			Internal Medicine		
	Mean (%)	Range (%)		Mean (%)	Range (%)	
		Lowest	Highest		Lowest	Highest
Age						
0-4 years	9	3	16	3	0	13
5-12 years	8	5	11	6	1	16
13-44 years	54	43	64	44	17	70
45-64 years	16	7	23	22	11	34
65 years or more	12	4	19	24	8	48
Sex						
Male	34	13	44	43	36	49
Diagnosis						
Upper respiratory infection	10	5	23	10	2	20
Otitis media	5	2	7	2	0	6
Hypertension	8	1	15	12	3	25
Disposition						
Return appointment	53	44	70	52	17	93
Referral	2	0	4	2	0	6
Hospitalization	1	0	2	1	0	4

Note: Data drawn from 28,258 office visits to 12 family physicians and 14 general internists occurring over a three-month period in 1979 cent in both). As expected, family physicians had more otitis media visits than the internists (5 percent vs 2 percent) and fewer hypertension encounters (8 percent vs 12 percent). (These differences may be explained by the differences in age group served by the two physician types.) There were only slight variations in the disposition of family physicians' and internists' patients.

Table 5. Baseline Results From Intrapractice Quality Assurance Study

Health Maintenance Activity	Percent of Patients* Receiving Instruction/ Screening Test (N=61)
Seat belt instruction	36
Pap smear administered	86
Hemoccult testing administered	45

*Patients residing outside practice's catchment area and with fewer than two visits over prior three years were excluded from the analysis

A Quality Assurance Study

Baseline results from one intrapractice quality audit are shown in Table 5. The practice believes that "every patient should have, or be encouraged to have, screening procedures or preventive instruction in areas where these have been demonstrated to be effective." To measure the extent to which practice principles are achieved, performance on three indicator conditions were analyzed: (1) seat belt use in children aged 0 to 4 years, (2) Pap smears in women aged 18 to 40 years, and (3) Hemoccult testing in men and women aged 50 to 75 years. The COOP Project data base was used to identify, at random, 20 patients in each category meeting entrance criteria, and a research assistant reviewed the medical records.

The findings indicate that the practice's degree of success was 36 percent for seat belt instruction, 45 percent for Hemoccult testing, and 86 percent on Pap smear screening. The practice attributes the good results for Pap smears to a recall system that has been in use for several years and has decided that similar office "systems" are needed to improve performance in the other two areas. The practice has instituted new office reminder systems and will repeat the quality audit in six months to assess progress.

Three Practice Management Studies

Billing Effectiveness Study

The first management study focused on the billing system. Study aims were to (1) document the cost each practice incurred in the performance of the billing function, (2) gauge the effectiveness of accounts receivable handling, and (3) explore the feasibility of modifying the billing systems (instead of the medical record systems) to enable practices to spin off compatible encounter data for a network as a byproduct of their business system. A practice management specialist visited 15 practices to collect information. Participant observation and interview methods were used to quantify the cost (labor, postage, and materials) incurred by performance of the billing and accounts receivable function. Financial records were analyzed to estimate billing and accounts receivable effectiveness (indicated by the number of days' worth of outstanding accounts receivable as a function of gross charges per day). Collection of comparable data across heterogeneous practices was expected to be difficult. Consequently, to minimize reliability problems, a single management specialist gathered all study data on work sheets in accordance with established guidelines.

The results indicate there were substantial variations in billing costs. Practice size ranged from one to five full-time providers and the number of full-time equivalent billing personnel from 0.5 to 1.9. Expenses for billing and accounts receivable handling per month per provider averaged $400 and were more than six times greater in the highest cost practice than in the lowest. Cost of billing per patient encounter averaged $1.50 and ranged from $0.70 to $3.75. Larger practices performed the billing function less expensively than smaller practices.

For example, sites with three or more providers had costs per provider per month averaging $260, while sites with fewer than three providers averaged $580. Expenses per encounter were $1.20 in the bigger practices, $1.95 in the smaller ones.

Two variables were used as indicators of billing system effectiveness: number of days gross billings outstanding in receivables, and outstanding receivables per provider. The former indicator of billing effectiveness, days' worth of billings outstanding in receivables, averaged 66 days and ranged from 36 days to 98 days. The latter effectiveness indicator, outstanding receivables per provider, averaged $14,000 and varied from $4,450 to $28,000. Further analysis suggests that billing system effectiveness is not associated with practice size; rather, it appears to be a function of billing policies followed by the practice on factors such as encouraging payment at time of service and accepting assignment from third party carriers.

It was found that five of the practices all register more than 30 percent of patients paying at time of service and do not accept assignment routinely. This set of practices, whose billing policies differentiate them from the rest, do substantially better than the other practices on both indicators of billing system effectiveness. Practices with more than 30 percent of patients paying at time of service averaged 53 days billings outstanding in receivables (vs 73 days for practices collecting 30 percent or less) and averaged $11,720 outstanding in receivables per provider (compared to $15,140 from other sites).

Practice Operating Costs Study

The second management study was designed to collect baseline data on practice overhead. The study had two goals. The first was to collect baseline data on practice overhead to show each site its relative standing in the COOP Project. The second goal was to assess the feasibility of developing compatible accounting systems across the network detailing revenues and expenses.* Data on practice overhead were collected by a management specialist using accounting reports on the past two fiscal years as source documents. It was possible to collect compatible information on operating expenses in 12 of 15 practices.

Annual operating expenses averaged $41,930 per provider and ranged from $21,260 to $55,309. The nonphysician payroll portion of the overhead averaged $20,150 and ranged from $8,900 to $37,680. Mean cost of office space was $5,150 and ranged from $2,130 to $8,760. The range in median charge per practice for a limited office visit was $10 to $16; and the range for a comprehensive examination was $15 to $42. Further analysis indicated there was a positive association between operating costs and patient charges for limited office visits. There was no correlation between overhead and fee for a comprehensive examination.

The COOP Project results were compared to the findings produced by the annual *Medical Economics* survey of practices[8] and the American Medical Association's Periodic Survey of Physicians[9] (Table 6). The COOP Project practices' total overhead and the proportion of overhead for nonphysician office payroll are similar to the former survey's results but differ from the American Medical Association's data, since the COOP Project sites have lower total expenses but higher office payroll.

Practice Panel Size Study

The findings from a practice panel size study are summarized in Table 7. The average number of active patients per provider (defined as all patients with one or more encounters during the two preceding years) was 1,266, with a low of 736 and a high of 1,664. The mean number of visits per year for active patients was three, while the range on number of visits per active patient was two to three. On the average, 58 percent of patients classed "active" in one year had one or more encounters in the subsequent year. The range in return rates for active patients was wide (48 percent to 76 percent).* Information on practice

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*The network began with an ongoing collection of patient visit data using compatible encounter forms. At this point, the aim was to expand the data base by collecting expense data throughout the network.

*These results were compared to findings reported for eight family practices located in Virginia.[9] The findings for the COOP Project practices were comparable to the Virginia practices on visits per year per active patient (2.7 vs 2.8). However, the average ~~one~~-year return rate was higher for the COOP Project sites (58 percent vs 41 percent).

Table 6. Comparison of COOP Project Practices to *Medical Economics* and American Medical Association Survey Results (dollars)

Practice Survey Group	Average Total Expense	Nonphysician Payroll (%)	Office Space (%)	All Other Tax Deductible Expenses (%)
Cooperative Project practices*	41,930	20,150 (48)	5,150 (12)	16,800 (40)
Medical Economics: United States practices**	39,040	17,780 (45.5)	6,300 (16.1)	14,960 (38.3)
American Medical Association periodic survey of physicians: United States practices***	46,400	15,006 (32.4)	7,392 (15.9)	24,002 (51.7)

*Average total practice expenses, per physician, all COOP Project practices, 1978

**Median total practice expenses per physician, all US practices, 1978. From Lavin JH: Practice costs, one battle you're winning. Med Econ, November 1979

***Average total practice expenses per physician, all US Practices, 1978. From American Medical Association: Projections, Thirteenth Periodic Survey of Physicians. Chicago, AMA Center for Health Services Research and Development, March 1978

growth showed the number of new patients per provider for the preceding six months averaged 191 (range 36 to 375), while the overall percentage of visits accounted for by new patients was 12 percent (range 2 percent to 21 percent).

Discussion

The objectives of the first set of clinical and management studies presented in the preceding section were to do the following: (1) form a constructive relationship between medical school faculty and community physicians, (2) spark interest in collaborative research and continuing education based on data collected in individual practices, and (3) devise a practical method for establishing a cross-practice information network that would be ongoing, inexpensive, and useful in meeting the data requirements of different vested (eg, educational, research, and financial) interests.

The formation of a constructive relationship between medical school faculty and community physicians had to be realized before any real progress could be made. Typical town-gown problems exist in the COOP Project region concerning matters such as patient referrals, role of medical center specialists vis a vis community physicians, and placement of medical students and residents in exemplary practices to gain clinical experience. Through conduct of these studies, medical school faculty and community physicians had the opportunity to get to know one another firsthand, to learn something about the concerns of each side, and to identify areas where working together would benefit both groups. As time passed, the community physicians began to trust the medical school faculty associated with the COOP Project. An organizational structure has evolved that places the practices in a decision making position and medical school personnel in technical assistance roles (ie, practice management, quality assurance, and practice data systems).

The second objective, promotion of interest in collaborative research and continuing education, was achieved. The practices have agreed to participate in up to two clinical and two management studies per year for the next four years. It was hoped that relevant clinical and management discussions could be triggered by feeding back the results of simple descriptive studies, showing each physician and practice where it stood within the group on process, outcome, and cost variables.

Table 7. Patient Panel Size Variations Among COOP Practices

Panel Characteristics	Active Patients/ Provider*	Average Visits Per Year (One-Year Active Patients)**	One-Year Return Rate for Active Patients†	Six-Month New Patients/ Provider††	Percent of Visits Made by New Patients
Individual Practices					
A	1,477	3	52	369	—
B	782	2	—	174	21
C	874	3	66	191	14
D	1,166	3	76	59	4
E	1,273	3	58	133	9
F	1,419	3	53	36	2
G	1,565	3	56	257	14
H	1,362	3	56	252	—
I	1,486	2	53	202	12
J	1,664	3	62	190	11
K	736	2	48	126	14
L	1,558	3	55	375	—
M	1,038	2	55	188	12
N	1,321	3	64	120	8
Mean	1,266	3	58	191	12
Range					
Highest	1,664	3	76	375	21
Lowest	736	2	48	36	2

*Active patients defined as number of patients with at least one visit during the two most recent fiscal years of practice operation

**One-year average of visits per year for active patients defined as average visits in year for patients with at least one visit in either baseline year

†One-year return rate defined as percent of patients with visits during first baseline year who also made at least one visit during second baseline year

††Number of patients seen by provider for first time during most recent six months of operation

The feedback sessions, which took place quarterly on Saturday mornings, taught the COOP Project coordinators several lessons. First, there is as much interest in management studies as in clinical research. Second, community physicians are highly critical of clinical studies on themselves that are not scientifically sound. Third, an increasingly large number of physicians are urging their colleagues to select prospective controlled studies that can expand the body of primary care knowledge and fill gaps in the literature. Fourth, descriptive studies followed by technical assistance (at least in the management area) can produce changes in performance. For example, all practices that had high billing costs and poor collections effectiveness took positive action to improve their system.

It is believed that the initial research activity, summarized above, did stimulate further interest in collaborative research and a new brand of education, probably because (1) participation was voluntary and study topics were selected by the group, (2) quantitative physician variations were produced, and (3) only limited effort was required by physicians and office staff to gather and analyze data. Future research topics will be selected by majority vote. The aim is to study the cost effectiveness of clinical care and to improve practice management efficiency.

The third objective, development of an ongoing information network, is the payoff resulting from achievement of the prior goals. From the outset, it was recognized that it would be highly desirable to construct a data system that reliably captured a minimum data set on all visits and fulfilled many functions (ie, was not a separate research-only, add-on system). It was also recognized that it is exceedingly difficult to encourage even two private practices, not to mention 20 or 30, to do something together over the long run that did not coincide with self-interest. Consequently, the approach taken in the formation of a network was slow, incremental, and designed as much to improve the practices' management systems as to facilitate research, education, and medical audit. This objective is well on the way to realization. Practices are contributing encounter data to the network, and there are more practices interested in joining.

Conclusion

It is well recognized that further development of the scientific basis for family medicine is essential. This will require prospective collection of valid information (on therapeutic process, health outcomes, and treatment costs) for representative groups of patients served by mainstream family physicians, and use of experimental research designs to test hypotheses in representative settings. In short, networks of sentinel practices—medical practices that code information on their practices' performance using comparable operational definitions and subsequently contribute the data to a cross-practice data base—must be developed before important hypotheses can be tested using good experimental designs in normal practices.

To develop a sentinel practice network capable of executing high-quality research, several obstacles must be overcome. First, a group of highly motivated persons who can organize a network must be identified from inside and outside the medical school (or similar institution). They must have sufficient time to devote to the task. Second, trust must be developed between primary care practices and the organizers; this may take years. Third, sources of ongoing financing must be developed to support a cost effective medical information system; this can best be accomplished by developing a multipurpose data system useful for functions such as practice management, quality assurance, education, and research.

Three years have been spent trying to overcome the three obstacles cited above. Beginning with 14 practices in 1977, the COOP Project has grown to include 44 practices in upper New England. The progress to date has been made by conducting a series of descriptive studies that showed each practice its standing within the group on clinical areas (hypertension treatment and screening and antibiotic prescribing patterns) and management topics (billing effectiveness and practice operating costs). The achievements to date are real but limited in terms of their contribution to research, education, and practice management. Plans for the coming years call for rigorous primary care research and the delivery of automated medical information and management services that can improve patient care and operating efficiency.

Acknowledgements

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EXHIBIT 2

PRIMARY CARE COOPERATIVE INFORMATION PROJECT

MONTHLY REPORT FOR FOREST HEALTH CENTER

MONTH 1982

	OFFICE VISITS		HOSPITAL VISITS*		OTHER OFF-SITE VISITS**		TOTAL VISITS	
	CM	YTD	CM	YTD	CM	YTD	CM	YTD
Practice Total								
Physician A								
Physician B								
Nurse Practitioner								
Psychologist								
No/Other Provider ID								
Practice 1980						***		

	OFFICE CHARGES		HOSPITAL CHARGES		OTHER OFF-SITE CHARGES		TOTAL CHARGES	
	CM	YTD	CM	YTD	CM	YTD	CM	YTD
Practice Total								
Physician A								
Physician B								
Nurse Practitioner								
Psychologist								
No/Other Provider ID								
Practice 1980								

	NO CHARGE VISITS		NEW PATIENTS		ON-SITE PAYMENT TOV		AVERAGE OFFICE CHARGE/VISIT****	
	CM	YTD	CM	YTD	CM	YTD	CM	YTD
Practice Total								
Physician A								
Physician B								
Nurse Practitioner								
Psychologist								
No/Other Provider ID								
Practice 1980								

*Procedure codes 9070-9089

**Procedure codes 9050-9069, 9090-9149

***1980 figure includes hospital visits.

****Where charges included.

EXHIBIT 3

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******************************************************
*                                                    *
*                                                    *
*  PRIMARY CARE COOPERATIVE INFORMATION PROJECT      *
*    QUARTERLY REPORT FOR  sample      M.D.          *
*             JANUARY-MARCH 1980                     *
*                                                    *
*                                                    *
******************************************************


                      ON-SITE     OFF-SITE    # DAYS      UNSCHEDULED   TOTAL       NEW
                      VISITS      VISITS*     WORKED      VISITS        PATIENTS    PATIENTS
                      ------      ------      ------      ------        --------    --------

                      1241          0           56           0            824         183

          M.D.         641          0           46           0            434          87
          P.A.         480          0           53           0            374          84
          R.N.          94          0           39           0             39           8
NO/OTHER PROVIDER ID    26          0

*  OFF-SITE VISITS = PROCEDURE CODES 9050-9149

                      ON-SITE     OFF-SITE      TOTAL        TOTAL          NO CHARGE   ON-SITE PYMT
                      CHARGES     CHARGES       PAYMENTS     ADJUSTMENTS    VISITS      % NET CHRGS
                      -------     -------       --------     -----------    ------      -----------

                   $ 25749.00   $    0.00   $ 11808.50   $   501.00       23          47%

          M.D.     $ 12770.00   $    0.00   $  6579.00   $   254.00       14          53%
          P.A.     $  9102.00   $    0.00   $  4096.50   $   336.00        8          47%
          R.N.     $  3155.00   $    0.00   $  1007.00   $     4.00        0          32%
NO/OTHER PROVIDER ID $  722.00   $    0.00   $   126.00   $     7.00
```

3.2

```
                    VISIT INFORMATION ON TOTAL PRACTICE


                    ON-SITE TYPE OF APPT

                    # VISITS       % VISITS
                    --------       --------

MISSING              1241


                    ON-SITE DISPOSITION

                    # VISITS       % VISITS
                    --------       --------

RET IF NEED          247            24.8
PENDG TESTS          91             9.1
REFD OUT             21             2.1
OTHER                14             1.4
HOSPITALIZE          5              0.5
RETURN APPT          614            61.8
MISSING              249


                    AVERAGE # VISITS FOR WEEKDAYS

                    WEEKDAY        AVE VISITS
                    -------        ----------

                    MONDAY          24.5
                    TUESDAY         26.3
                    WEDNESDAY       3.3
                    THURSDAY        25.5
                    FRIDAY          17.3
```

PROCEDURE FREQUENCY & CONTRIBUTION REPORT
M.D.

	PROCEDURE	# VISITS	% TOTAL VISITS	CHARGES	% TOTAL CHARGES	AVERAGE CHARGE
9025	LIMITED EXAM-EST PT	530	82.7	$ 7762.00	60.8	$ 14.65
8920	CYTOPATHOLOGY SMEAR (PAP)	51	8.0	$ 408.00	3.2	$ 8.00
9003	LIMITED HX & PX - NEW PT	33	5.1	$ 640.00	5.0	$ 19.39
8320	BLOOD SUGAR	28	4.4	$ 140.00	1.1	$ 5.00
9023	BRIEF OFFICE VISIT-EST PT	19	3.0	$ 215.00	1.7	$ 11.32
8898	CULTURE-URINE	13	2.0	$ 55.00	0.4	$ 4.23
8700	URINALYSIS-ROUTINE	13	2.0	$ 70.00	0.5	$ 5.38
9021	IMMUNIZATION	10	1.6	$ 73.00	0.6	$ 7.30
9026	INTERMEDIATE EXAM-EST PT	10	1.6	$ 190.00	1.5	$ 19.00
9004	INTERMED HX & PX-NEW PT	9	1.4	$ 225.00	1.8	$ 25.00
9030	COMPREHENSIVE EXAM-EST PT	8	1.2	$ 240.00	1.9	$ 30.00
8361	BLOOD COUNT-COMPLETE	4	0.6	$ 32.00	0.3	$ 8.00
0410	REMOVAL OF WARTS	3	0.5	$ 66.00	0.5	$ 22.00
4710	IUD INSERTION	3	0.5	$ 105.00	0.8	$ 35.00
9354	TYMPANOMETRY	3	0.5	$ 30.00	0.2	$ 10.00
8831	WET MOUNT FOR BACTERIA	3	0.5	$ 9.00	0.1	$ 3.00
8366	HEMOGLOBIN	2	0.3	$ 2.00	0.0	$ 1.00
8556	TINE TEST	2	0.3	$ 4.00	0.0	$ 2.00
8885	CULTURE-ALL OTHER SOURCES	2	0.3	$ 8.00	0.1	$ 4.00
8347	URIC ACID	1	0.2	$ 6.00	0.0	$ 6.00
9022	ALLERGY INJECTION	1	0.2	$ 5.00	0.0	$ 5.00
9020	MINIMAL SERVICE-EST PT	1	0.2	$ 10.00	0.1	$ 10.00
4621	CAUTERIZATION OF CERVIX	1	0.2	$ 22.00	0.2	$ 22.00
8266	LIPIDS	1	0.2	$ 14.00	0.1	$ 14.00
4840	COMPLETE PRE&POST NATAL CAR	1	0.2	$ 300.00	2.3	$ 300.00
9010	COMP HX & PX-NEW PT	1	0.2	$ 35.00	0.3	$ 35.00
8344	UREA NITROGEN	1	0.2	$ 5.00	0.0	$ 5.00
8775	PREGNANCY TEST	1	0.2	$ 12.00	0.1	$ 12.00
8434	PROTHROMBIN	1	0.2	$ 6.00	0.0	$ 6.00
0000	NOT CODED	12	1.9	$ 571.00	4.5	$ 47.58
9999	ALL OTHER	43	6.7	$ 1510.00	11.8	$ 35.12
	NO PROCEDURE RECORDED	1				

SUM OF PROC CHARGES = $ 12770

DIAGNOSIS FREQUENCY REPORT

M.D.

	DIAGNOSIS	# VISITS	% VISITS	# PATIENTS	% PATIENTS	VISITS/PT
401	HYPERTENSION	79	12.3	67	13.8	1.2
563	CHRONIC ENTERITIS	70	10.9	57	11.8	1.2
465	ACUTE URI	57	8.9	52	10.7	1.1
277	OBESITY	54	8.4	46	9.5	1.2
466	ACUTE BRONCHITIS	53	8.3	44	9.1	1.2
412	CHRONIC ISCHEMIC HT DIS	48	7.5	41	8.5	1.2
250	DIABETES MELLITUS	45	7.0	39	8.1	1.2
622	INFECTIVE DIS OF UTERUS	44	6.9	34	7.0	1.3
715	ARTHRITIS	37	5.8	31	6.4	1.2
Y09	CONTRACEPTION	35	5.5	31	6.4	1.1
Y00	MEDICAL EXAMINATION	31	4.8	29	6.0	1.1
626	DISORDERS OF MENSTRUATION	32	5.0	27	5.6	1.2
790	NERVOUSNESS AND DEBILITY	24	3.7	19	3.9	1.3
507	HAY FEVER	19	3.0	18	3.7	1.1
519	OTHER RESPIRATORY	18	2.8	17	3.5	1.1
692	OTHER ECZEMA AND DERMATITI	14	2.2	14	2.9	1.0
381	OTITIS MEDIA	19	3.0	14	2.9	1.4
599	UTI	14	2.2	13	2.7	1.1
300	NEUROSES	12	1.9	12	2.5	1.0
303	ALCOHOLISM	16	2.5	12	2.5	1.3
079	OTHER VIRAL DISEASES	12	1.9	12	2.5	1.0
Y06	PRENATAL CARE	8	1.2	8	1.7	1.0
244	MYXEDEMA	5	0.8	4	0.8	1.2
791	HEADACHE	6	0.9	4	0.8	1.5
486	PNEUMONIA	4	0.6	4	0.8	1.0
731	SYNOVITIS	4	0.6	3	0.6	1.3
601	PROSTATITIS	3	0.5	3	0.6	1.0
783	RESPIRATORY SYMPTOMS	3	0.5	2	0.4	1.5
112	MONILIASIS	1	0.2	1	0.2	1.0
162	MALIGNANT NEOPLASM OF LUNG	1	0.2	1	0.2	1.0
274	GOUT	1	0.2	1	0.2	1.0
360	CONJUNCTIVITIS	1	0.2	1	0.2	1.0
398	OTHER HEART DISEASE	1	0.2	1	0.2	1.0
451	PHLEBITIS	1	0.2	1	0.2	1.0
454	VARICOSE VEINS	1	0.2	1	0.2	1.0
380	OTITIS EXTERNA	1	0.2	1	0.2	1.0
295	SCHIZOPHRENIS	1	0.2	1	0.2	1.0
627	MENOPAUSAL SYMPTOMS	1	0.2	1	0.2	1.0
470	INFLUENZA	1	0.2	1	0.2	1.0
053	HERPES ZOSTER	2	0.3	1	0.2	2.0
054	HERPES SIMPLEX	1	0.2	1	0.2	1.0
075	INFECTIOUS MONONUCLEOSIS	1	0.2	1	0.2	1.0
099	OTHER VENEREAL DISEASE	1	0.2	1	0.2	1.0
9999	ALL OTHER	145	22.6	122	25.2	1.2
	NO DX RECORDED/CODED	9				

```
                  PATIENT CHARACTERISTICS REPORT
                          M.D.
                  AGE AND SEX

AGE               # MALE          # FEMALE        % AGE
---               ------          --------        -----

0-4                17              20              7.7
5-9                4               11              3.1
10-14              5               12              3.5
12-19              5               13              3.7
20-34              48              121             35.3
35-44              24              36              12.5
45-64              28              60              18.4
65-OVER            12              62              15.4

TOTAL # PTS        143             335             478
MISSING SEX        5
MISSING AGE        1


                  PATIENT RESIDENCE

TOWNCODE          # PTS           % PTS
--------          -----           -----

A                  2               0.6
M                  2               0.6
M                  2               0.6
M                  5               1.5
W                  125             38.3
S                  108             33.1
W                  36              11
S                  6               1.8
ALL OTHER          40              12.2
MISSING DATA       158


                  PRIMARY INSURANCE

                  # PTS           % PTS
                  -----           -----

SELF PAY           89              25.7
BLUE SHIELD        121             35
MEDICARE           65              18.8
MEDICAID           27              7.8
OTHER              43              12.4
MISSING DATA       139
```

3.6

PROCEDURE FREQUENCY & CONTRIBUTION REPORT
P.A.

	PROCEDURE	# VISITS	% TOTAL VISITS	CHARGES	% TOTAL CHARGES	AVERAGE CHARGE
9025	LIMITED EXAM-EST PT	305	63.5	$ 4485.00	49.3	$ 14.70
9003	LIMITED HX & PX - NEW PT	54	11.2	$ 1080.00	11.9	$ 20.00
8320	BLOOD SUGAR	21	4.4	$ 105.00	1.2	$ 5.00
9026	INTERMEDIATE EXAM-EST PT	19	4.0	$ 360.00	4.0	$ 18.95
9023	BRIEF OFFICE VISIT-EST PT	19	4.0	$ 224.00	2.5	$ 11.79
9030	COMPREHENSIVE EXAM-EST PT	18	3.7	$ 535.00	5.9	$ 29.72
9021	IMMUNIZATION	17	3.5	$ 116.00	1.3	$ 6.82
9004	INTERMED HX & PX-NEW PT	15	3.1	$ 375.00	4.1	$ 25.00
8700	URINALYSIS-ROUTINE	15	3.1	$ 90.00	1.0	$ 6.00
9354	TYMPANOMETRY	14	2.9	$ 140.00	1.5	$ 10.00
8888	CULTURE-URINE	13	2.7	$ 65.00	0.7	$ 5.00
8920	CYTOPATHOLOGY SMEAR (PAP)	12	2.5	$ 96.00	1.1	$ 8.00
8361	BLOOD COUNT-COMPLETE	11	2.3	$ 88.00	1.0	$ 8.00
9020	MINIMAL SERVICE-EST PT	9	1.9	$ 50.00	0.5	$ 5.55
9010	COMP HX & PX-NEW PT	7	1.5	$ 245.00	2.7	$ 35.00
8556	TINE TEST	6	1.2	$ 12.00	0.1	$ 2.00
9800	LAB HANDLING CHARGE	6	1.2	$ 12.00	0.1	$ 2.00
9370	EKG WITH INTER & RPT	5	1.0	$ 100.00	1.1	$ 20.00
9351	HEARING TEST	4	0.8	$ 80.00	0.9	$ 20.00
8885	CULTURE-ALL OTHER SOURCES	4	0.8	$ 16.00	0.2	$ 4.00
8881	WET MOUNT FOR BACTERIA	2	0.4	$ 6.00	0.1	$ 3.00
8366	HEMOGLOBIN	2	0.4	$ 5.00	0.1	$ 2.50
9022	ALLERGY INJECTION	1	0.2	$ 15.00	0.2	$ 15.00
8775	PREGNANCY TEST	1	0.2	$ 12.00	0.1	$ 12.00
0000	NOT CODED	11	2.3	$ 75.00	0.8	$ 6.82
9999	ALL OTHER	54	11.2	$ 715.00	7.9	$ 13.24
	NO PROCEDURE RECORDED	1				

SUM OF PROC CHARGES = $ 9102

DIAGNOSIS FREQUENCY REPORT
P.A.

	DIAGNOSIS	# VISITS	% VISITS	# PATIENTS	% PATIENTS	VISITS/PT
465	ACUTE URI	81	16.9	76	19.3	1.1
401	HYPERTENSION	58	12.1	49	12.4	1.2
Y00	MEDICAL EXAMINATION	49	10.2	46	11.7	1.1
466	ACUTE BRONCHITIS	49	10.2	45	11.4	1.1
563	CHRONIC ENTERITIS	48	10.0	42	10.7	1.1
507	HAY FEVER	35	7.3	34	8.6	1.0
381	OTITIS MEDIA	43	9.0	31	7.9	1.4
277	OBESITY	30	6.2	30	7.6	1.0
790	NERVOUSNESS AND DEBILITY	29	6.0	27	6.9	1.1
412	CHRONIC ISCHEMIC HT DIS	34	7.1	24	6.1	1.4
250	DIABETES MELLITUS	25	5.2	21	5.3	1.2
519	OTHER RESPIRATORY	24	5.0	20	5.1	1.2
715	ARTHRITIS	21	4.4	18	4.6	1.2
079	OTHER VIRAL DISEASES	12	2.5	11	2.8	1.1
300	NEUROSES	11	2.3	11	2.8	1.0
599	UTI	15	3.1	11	2.8	1.4
626	DISORDERS OF MENSTRUATION	11	2.3	9	2.3	1.2
622	INFECTIVE DIS OF UTERUS	9	1.9	8	2.0	1.1
486	PNEUMONIA	8	1.7	7	1.8	1.1
692	OTHER ECZEMA AND DERMATITI	7	1.5	6	1.5	1.2
731	SYNOVITIS	5	1.0	5	1.3	1.0
398	OTHER HEART DISEASE	5	1.0	5	1.3	1.0
303	ALCOHOLISM	4	0.8	4	1.0	1.0
427	SYMPTOMATIC HEART DISEASE	4	0.8	4	1.0	1.0
783	RESPIRATORY SYMPTOMS	4	0.8	4	1.0	1.0
Y02	INOCULATIONS	3	0.6	3	0.8	1.0
455	HEMORRHOIDS	2	0.4	2	0.5	1.0
550	INGUINAL HERNIA	2	0.4	2	0.5	1.0
360	CONJUNCTIVITIS	2	0.4	2	0.5	1.0
413	ANGINA PECTORIS	2	0.4	2	0.5	1.0
708	URTICARIA	2	0.4	2	0.5	1.0
244	MYXEDEMA	2	0.4	2	0.5	1.0
785	ABDOMEN & LOWER GI SYMP	2	0.4	2	0.5	1.0
Y09	CONTRACEPTION	2	0.4	2	0.5	1.0
374	CATARACT	1	0.2	1	0.3	1.0
053	HERPES ZOSTER	1	0.2	1	0.3	1.0
075	INFECTIOUS MONONUCLEOSIS	1	0.2	1	0.3	1.0
Y06	PRENATAL CARE	1	0.2	1	0.3	1.0
380	OTITIS EXTERNA	2	0.4	1	0.3	2.0
470	INFLUENZA	1	0.2	1	0.3	1.0
451	PHLEBITIS	1	0.2	1	0.3	1.0
791	HEADACHE	1	0.2	1	0.3	1.0
461	ACUTE SINUSITIS	1	0.2	1	0.3	1.0
491	CHRONIC BRONCHITIS	1	0.2	1	0.3	1.0
600	HYPERPLASIA OF PROSTRATE	1	0.2	1	0.3	1.0
930	FOREIGN BODY IN EYE	1	0.2	1	0.3	1.0
9999	ALL OTHER	139	29.0	118	29.9	1.2
	NO DX RECORDED/CODED	6				

PATIENT CHARACTERISTICS REPORT
P.A.

AGE AND SEX

AGE	# MALE	# FEMALE	% AGE
0-4	22	13	9.1
5-9	10	19	7.5
10-14	12	15	7
12-19	15	18	8.5
20-34	72	47	30.9
35-44	22	24	11.9
45-64	21	35	14.5
65-OVER	10	29	10.1
TOTAL # PTS	184	200	384
MISSING SEX	7		
MISSING AGE	5		

PATIENT RESIDENCE

TOWNCODE	# PTS	% PTS
A	3	1.1
M	4	1.5
H	1	0.3
N	2	0.7
W	92	34.8
S	77	29.1
H	37	14
S	4	1.5
ALL OTHER	44	16.6
MISSING DATA	130	

PRIMARY INSURANCE

	# PTS	% PTS
SELF PAY	93	31.4
BLUE SHIELD	97	32.7
MEDICARE	33	11.1
MEDICAID	23	7.7
OTHER	50	16.8
MISSING DATA	98	

```
                        PROCEDURE FREQUENCY & CONTRIBUTION REPORT
                                          R.N.

                                                % TOTAL                           % TOTAL        AVERAGE
        PROCEDURE                      # VISITS    VISITS          CHARGES           CHARGES        CHARGE
        ---------                      --------    ------          -------           -------        ------

8700    URINALYSIS-ROUTINE                  50        53.2      $   250.00            7.9       $    5.00
8361    BLOOD COUNT-COMPLETE                49        52.1      $   392.00           12.4       $    8.00
9800    LAB HANDLING CHARGE                 43        45.7      $    86.00            2.7       $    2.00
8888    CULTURE-URINE                       14        14.9      $    65.00            2.1       $    4.64
9370    EKG WITH INTER & RPT                10        10.6      $   200.00            6.3       $   20.00
8320    BLOOD SUGAR                          7         7.4      $    35.00            1.1       $    5.00
8775    PREGNANCY TEST                       6         6.4      $    72.00            2.3       $   12.00
9021    IMMUNIZATION                         3         3.2      $    28.00            0.9       $    9.33
9351    HEARING TEST                         1         1.1      $    20.00            0.6       $   20.00
9026    INTERMEDIATE EXAM-EST PT             1         1.1      $    12.00            0.4       $   12.00
9354    TYMPANOMETRY                         1         1.1      $    10.00            0.3       $   10.00
9025    LIMITED EXAM-EST PT                  1         1.1      $    15.00            0.5       $   15.00
8347    URIC ACID                            1         1.1      $     5.00            0.2       $    5.00
0900    NOT CODED                            6         6.4      $   106.00            3.3       $   17.67
9999    ALL OTHER                          121       128.7      $  1869.00           59.1       $   15.45
        NO PROCEDURE RECORDED                0
        SUM OF PROC CHARGES = $ 3165
```

DIAGNOSIS FREQUENCY REPORT
R.N.

	DIAGNOSIS	# VISITS	% VISITS	# PATIENTS	% PATIENTS	VISITS/PT
790	NERVOUSNESS AND DEBILITY	22	23.4	20	22.5	1.1
401	HYPERTENSION	13	13.8	12	13.5	1.1
563	CHRONIC ENTERITIS	10	10.6	10	11.2	1.0
599	UTI	10	10.6	10	11.2	1.0
715	ARTHRITIS	9	9.6	9	10.1	1.0
Y06	PRENATAL CARE	9	9.6	9	10.1	1.0
250	DIABETES MELLITUS	8	8.5	8	9.0	1.0
412	CHRONIC ISCHEMIC HT DIS	7	7.4	7	7.9	1.0
465	ACUTE URI	5	5.3	5	5.6	1.0
519	OTHER RESPIRATORY	5	5.3	5	5.6	1.0
Y00	MEDICAL EXAMINATION	3	3.2	3	3.4	1.0
507	HAY FEVER	2	2.1	2	2.2	1.0
381	OTITIS MEDIA	2	2.1	2	2.2	1.0
075	INFECTIOUS MONONUCLEOSIS	2	2.1	2	2.2	1.0
277	OBESITY	2	2.1	2	2.2	1.0
692	OTHER ECZEMA AND DERMATITI	2	2.1	2	2.2	1.0
300	NEUROSES	2	2.1	2	2.2	1.0
398	OTHER HEART DISEASE	1	1.1	1	1.1	1.0
626	DISORDERS OF MENSTRUATION	1	1.1	1	1.1	1.0
079	OTHER VIRAL DISEASES	1	1.1	1	1.1	1.0
303	ALCOHOLISM	1	1.1	1	1.1	1.0
783	RESPIRATORY SYMPTOMS	1	1.1	1	1.1	1.0
600	HYPERPLASIA OF PROSTRATE	1	1.1	1	1.1	1.0
9999	ALL OTHER	16	17.0	15	15.9	1.1
	NO DX RECORDED/CODED	3				

```
                         PATIENT CHARACTERISTICS REPORT
                                        R.N.

                         AGE AND SEX

AGE                      # MALE              # FEMALE          % AGE
---                      ------              --------          -----

5-9                       0                  2                  2.2
10-14                     1                  2                  3.4
12-19                     2                  2                  4.5
20-34                     12                 21                 37.9
35-44                     6                  9                  17.2
45-64                     10                 10                 22.9
65-OVER                   3                  7                  11.4

TOTAL # PTS               34                 53                 87
MISSING SEX               0
MISSING AGE               2


                         PATIENT RESIDENCE

TOWNCODE                 # PTS               % PTS
--------                 -----               -----

A                         2                   2.7
B                         1                   1.3
M                         2                   2.7
W                         24                  33.3
S                         19                  26.3
N                         10                  13.8
S                         1                   1.3
ALL OTHER                 13                  18
MISSING DATA              17


                         PRIMARY INSURANCE

                         # PTS               % PTS
                         -----               -----

SELF PAY                  16                  24.2
BLUE SHIELD               32                  48.4
MEDICARE                  5                   7.5
MEDICAID                  1                   1.5
OTHER                     12                  18.1
MISSING DATA              23
```

```
                         PROCEDURE FREQUENCY & CONTRIBUTION REPORT

                                                       % TOTAL                    % TOTAL     AVERAGE
       PROCEDURE                           # VISITS    VISITS       CHARGES       CHARGES     CHARGE
       ---------                           --------    ------       -------       -------     ------

9025   LIMITED EXAM-EST PT                   850        68.5     $ 12472.00        48.4     $  14.67
9003   LIMITED HX & PX - NEW PT               88         7.1     $  1740.00         6.8     $  19.77
8700   URINALYSIS-ROUTINE                     79         6.4     $   415.00         1.6     $   5.25
8920   CYTOPATHOLOGY SMEAR (PAP)              65         5.2     $   520.00         2.0     $   8.00
8361   BLOOD COUNT-COMPLETE                   65         5.2     $   520.00         2.0     $   8.00
8320   BLOOD SUGAR                            58         4.7     $   290.00         1.1     $   5.00
9800   LAB HANDLING CHARGE                    50         4.0     $   100.00         0.4     $   2.00
8898   CULTURE-URINE                          40         3.2     $   185.00         0.7     $   4.62
9023   BRIEF OFFICE VISIT-EST PT              38         3.1     $   439.00         1.7     $  11.55
9021   IMMUNIZATION                           31         2.5     $   223.00         0.9     $   7.19
9026   INTERMEDIATE EXAM-EST PT               30         2.4     $   562.00         2.2     $  18.73
9030   COMPREHENSIVE EXAM-EST PT              26         2.1     $   775.00         3.0     $  29.81
9004   INTERMED HX & PX-NEW PT                24         1.9     $   600.00         2.3     $  25.00
9354   TYMPANOMETRY                           18         1.5     $   180.00         0.7     $  10.00
9370   EKG WITH INTER & RPT                   15         1.2     $   300.00         1.2     $  20.00
8556   TINE TEST                              10         0.8     $    20.00         0.1     $   2.00
9020   MINIMAL SERVICE-EST PT                 10         0.8     $    60.00         0.2     $   6.00
9010   COMP HX & PX-NEW PT                     8         0.6     $   280.00         1.1     $  35.00
8775   PREGNANCY TEST                          8         0.6     $    96.00         0.4     $  12.00
8985   CULTURE-ALL OTHER SOURCES               6         0.5     $    24.00         0.1     $   4.00
9351   HEARING TEST                            5         0.4     $   100.00         0.4     $  20.00
8991   WET MOUNT FOR BACTERIA                  5         0.4     $    15.00         0.1     $   3.00
8366   HEMOGLOBIN                              4         0.3     $     7.00         0.0     $   1.75
4710   IUD INSERTION                           3         0.2     $   105.00         0.4     $  35.00
0410   REMOVAL OF WARTS                        3         0.2     $    66.00         0.3     $  22.00
9022   ALLERGY INJECTION                       2         0.2     $    20.00         0.1     $  10.00
8347   URIC ACID                               2         0.2     $    11.00         0.0     $   5.50
4340   COMPLETE PRE&POST NATAL CAR             1         0.1     $   300.00         1.2     $ 300.00
8266   LIPIDS                                  1         0.1     $    14.00         0.1     $  14.00
4621   CAUTERIZATION OF CERVIX                 1         0.1     $    22.00         0.1     $  22.00
8344   UREA NITROGEN                           1         0.1     $     5.00         0.0     $   5.00
8434   PROTHROMBIN                             1         0.1     $     6.00         0.0     $   6.00
0000   NOT CODED                              32         2.6     $   812.00         3.2     $  25.37
9999   ALL OTHER                             223        18.0     $  4475.00        17.4     $  20.07
       NO PROCEDURE RECORDED                   3
       SUM OF PROC CHARGES = $ 25759
```

DIAGNOSIS FREQUENCY REPORT

	DIAGNOSIS	# VISITS	% VISITS	# PATIENTS	% PATIENTS	VISITS/PT
465	ACUTE URI	145	11.7	130	15.8	1.1
401	HYPERTENSION	151	12.2	113	13.7	1.3
563	CHRONIC ENTERITIS	129	10.4	95	11.5	1.4
466	ACUTE BRONCHITIS	103	8.3	81	9.8	1.3
Y00	MEDICAL EXAMINATION	87	7.0	80	9.7	1.1
277	OBESITY	87	7.0	72	8.7	1.2
412	CHRONIC ISCHEMIC HT DIS	89	7.2	62	7.5	1.4
250	DIABETES MELLITUS	78	6.3	61	7.4	1.3
790	NERVOUSNESS AND DEBILITY	77	6.2	59	7.2	1.3
507	HAY FEVER	57	4.6	53	6.4	1.1
715	ARTHRITIS	68	5.5	53	6.4	1.3
622	INFECTIVE DIS OF UTERUS	54	4.4	42	5.1	1.3
519	OTHER RESPIRATORY	47	3.8	37	4.5	1.3
381	OTITIS MEDIA	64	5.2	35	4.2	1.8
626	DISORDERS OF MENSTRUATION	45	3.6	34	4.1	1.3
Y09	CONTRACEPTION	37	3.0	33	4.0	1.1
599	UTI	40	3.2	29	3.5	1.4
079	OTHER VIRAL DISEASES	26	2.1	25	3.0	1.0
300	NEUROSES	26	2.1	24	2.9	1.1
692	OTHER ECZEMA AND DERMATITI	23	1.9	21	2.5	1.1
Y06	PRENATAL CARE	19	1.5	15	1.8	1.3
303	ALCOHOLISM	21	1.7	15	1.8	1.4
486	PNEUMONIA	12	1.0	10	1.2	1.2
731	SYNOVITIS	9	0.7	8	1.0	1.1
398	OTHER HEART DISEASE	7	0.6	6	0.7	1.2
783	RESPIRATORY SYMPTOMS	8	0.6	6	0.7	1.3
244	MYXEDEMA	7	0.6	6	0.7	1.2
791	HEADACHE	8	0.6	5	0.6	1.6
427	SYMPTOMATIC HEART DISEASE	4	0.3	4	0.5	1.0
Y02	INOCULATIONS	4	0.3	4	0.5	1.0
075	INFECTIOUS MONONUCLEOSIS	4	0.3	4	0.5	1.0
360	CONJUNCTIVITIS	3	0.2	3	0.4	1.0
601	PROSTATITIS	3	0.2	3	0.4	1.0
550	INGUINAL HERNIA	2	0.2	2	0.2	1.0
470	INFLUENZA	2	0.2	2	0.2	1.0
455	HEMORRHOIDS	2	0.2	2	0.2	1.0
708	URTICARIA	2	0.2	2	0.2	1.0
413	ANGINA PECTORIS	2	0.2	2	0.2	1.0
735	ABDOMEN & LOWER GI SYMP	2	0.2	2	0.2	1.0
451	PHLEBITIS	2	0.2	2	0.2	1.0
053	HERPES ZOSTER	3	0.2	2	0.2	1.5
600	HYPERPLASIA OF PROSTRATE	2	0.2	2	0.2	1.0
380	OTITIS EXTERNA	3	0.2	2	0.2	1.5
295	SCHIZOPHRENIS	1	0.1	1	0.1	1.0
099	OTHER VENEREAL DISEASE	1	0.1	1	0.1	1.0
112	MONILIASIS	1	0.1	1	0.1	1.0
162	MALIGNANT NEOPLASM OF LUNG	1	0.1	1	0.1	1.0
274	GOUT	1	0.1	1	0.1	1.0
374	CATARACT	1	0.1	1	0.1	1.0
461	ACUTE SINUSITIS	1	0.1	1	0.1	1.0

PATIENT CHARACTERISTICS REPORT

AGE AND SEX

AGE	# MALE	# FEMALE	% AGE
0-4	22	30	7.3
5-9	14	26	4.9
10-14	17	24	5
12-19	19	29	5.9
20-34	110	168	34.4
35-44	46	55	12.5
45-64	50	87	16.9
65-OVER	20	83	12.7
TOTAL # PTS	305	502	807
MISSING SEX	11		
MISSING AGE	8		

PATIENT RESIDENCE

TOWNCODE	# PTS	% PTS
A	5	0.8
M	7	1.2
M	3	0.5
M	6	1
W	202	36
S	173	30.8
N	71	12.6
S	10	1.7
ALL OTHER	83	14.8
MISSING DATA	264	

PRIMARY INSURANCE

	# PTS	% PTS
SELF PAY	162	27.1
BLUE SHIELD	215	36
MEDICARE	90	15.1
MEDICAID	45	7.5
OTHER	84	14
MISSING DATA	228	

EXHIBIT 4

PRIMARY CARE COOPERATIVE INFORMATION PROJECT

1981 YEAR-END REPORT

FOREST HEALTH CENTER

PREFACE

The following tables and graphs represent a selected summary of encounter form data collected by the Primary Care Cooperative Information Project in 23 New Hampshire and Vermont private practices in 1980 and 1981. The purpose of this summary report is:

(1) to provide each practice with a quick overview of key aspects of their practice and,

(2) to allow practices to compare themselves with other COOP practices on many of these same aspects.

Brief comments have been included with each table to provide a starting point from which each practice can begin to interpret the data.

Questions or comments concerning this report can be addressed to Patricia Hale or Mary Conrad at (603) 646-3631.

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2. By Age/Sex Groups 32

I. PRACTICE SUMMARY

Comments:

This practice recorded more activity in the winter and summer quarters than in the spring and fall. The percentage of new patients recorded remained relatively constant for each quarter. There were no remarkable changes in patient characteristics. In comparison with other family practitioners, this practice sees a high percentage of elderly patients. The rankings of the most frequent diagnoses have remained fairly constant from quarter to quarter. In comparison with other family practitioners this practice records a high percentage of birth control visits and a low percentage of bronchitis.

1981 PRACTICE PROFILE BY QUARTER

ACTIVITY AND PATIENT CHARACTERISTICS

ACTIVITY	FIRST	SECOND	THIRD	FOURTH
Office Visits	1,506	1,335	1,533	1,395
Off-Site Visits	392	207	451	322
Office Charges	$27,109	$24,751	$30,302	$25,452
Off-Site Charges	$ 7,897	$ 4,102	$ 8,217	$ 6,543
# New Patients	179	128	197	141
Office Payment % Net Charges	35%	40%	40%	42%
PATIENT CHARACTERISTICS				
% Female	58%	60%	58%	58%
% ≥ 65	19%	22%	20%	22%
% Blue Shield	43%	41%	42%	39%
% Medicaid	7%	7%	6%	7%
% Zipcode -- A	28%	23%	26%	27%
B	16%	18%	20%	20%
C	5%	7%	6%	5%
TOP 5 DIAGNOSES -- # PATIENTS				
401 -- Hypertension	83	93	112	106
V20 -- Well Child	73	70	105	74
V22 -- IUP	67	63	64	52
465 -- Pharyngitis/URI	56	29	36	69
V25 -- Birth Control	37	46	41	49

Comments:

In 1981 there has been a decline in total office visits of 5% from the previous year, although there has been an increase in new patients of 6%. The average charge per office visit has increased a modest 5% and there has been an increase in the overall revisit rate. While hospital admissions have decreased, deliveries have slightly increased. There has been no change in the non-use of new patient procedure codes, while the coding of intermediate exams has decreased slightly. The percent of 9025's coded is approximately the median for the COOP Project. In 1981 as in 1980, this practice had the highest volume of office visits per physician of all COOP practices.

CHANGES IN PRODUCTIVITY 1980 - 1981

ACTIVITY	1980	1981
# Office Visits	6,077	5,769
# Office Patients	2,310	1,920
Office Charges	$107,838	$107,614
Average Charge/Office Visit	$17.75	$18.65
Average Office Visits/Patient	2.6	3.0
# New Patients	610	645
% New Patients with New Patient Procedure Codes (9003, 9004, 9010)	0%	0%
# New Patients as % Office Visits	10%	11%
SELECTED PROCEDURES		
9070/9071 -- Hospital Admission	177	144
9370 -- EKG	205	198
% Office Visits	3%	3%
8700/8701 -- Urinalysis	696	533
% Office Visits	11%	9%
4840 -- OB Care/Delivery	51	57
Ratio 9025/9026 Routine Visit/Intermediate Visit	6.2	6.5
Ratio 9025/9023 Routine Visit/Brief Visit	12.8	14.1

Comments:

The ranking of diagnoses by body system has remained generally constant from 1980 to 1981. (The completeness of recording diagnoses has improved.) Increases of 3% have been recorded in injuries and circulatory system problems; a decrease of 3% has been recorded in respiratory system problems.

DISTRIBUTION OF OFFICE DIAGNOSES BY BODY SYSTEM

OCTOBER - DECEMBER 1980 AND 1981

DIAGNOSTIC CATEGORY	CODES	PERCENT OF PATIENTS WITH DX IN THIS CATEGORY	
		1980	1981
Examinations	V01 - V82	22%	24%
Circulatory System	390 - 459	18%	21%
Respiratory System	460 - 519	17%	14%
Injury & Poison	800 - 899	10%	13%
Nervous System	320 - 389	9%	9%
Genitourinary System	580 - 676	7%	6%
Endocrine	240 - 279	7%	5%
Skin	680 - 709	6%	6%
Infection & Parasites	001 - 139	5%	7%
Ill-Defined	780 - 799	5%	4%
Digestive System	520 - 579	5%	5%
Musculoskeletal	710 - 739	4%	6%
Mental Disorders	290 - 319	2%	4%
Neoplasms	140 - 239	1%	2%
Blood	280 - 289	1%	1%
Perinatal	740 - 779	1%	0%
Diagnosis Not Coded		108 visits	38 visits
Average Diagnoses Per Visit		1.1	1.0

Comments:

Office charges were 6% higher and hospital charges 9% higher in the fourth quarter of 1981 than in the fourth quarter of 1980. Ancillary charges (lab plus diagnostic procedures), on the other hand, were 20% lower in 1981.

CHARGES BY TYPE OF SERVICE

OCTOBER - DECEMBER 1980 AND 1981

TYPE OF SERVICE*	1980	1981
Office	$16,723	$17,723
Surgery	$ 6,971	$ 5,388
Hospital	$ 3,824	$ 4,154
Special RX & DX	$ 1,843	$ 1,255
Emergency Room	$ 1,675	$ 1,540
Lab/Pathology	$ 1,344	$ 1,283
Home	$ 324	$ 577

*Procedure Codes: Office = 9000 - 9049, Surgery = 0001 - 5999, Hospital = 9070 - 9089, Special RX & DX = 6000 - 7999 & 9150 - 9200 & 9300 - 9799, Emergency Room = 9120 - 9149, Lab/Pathology = 8000 - 8999 & 9800 - 9999, Home = 9050 - 9069 & 9090 - 9110.

Comments:

In the eighteen months from May 1980 to November 1981, there has been relatively little change in the fee schedule. In fact the average charge per visit during November of 1981 was actually lower than that recorded in May of 1980.

CHANGES IN SELECTED PROCEDURE FEES

MAY 1980 - NOVEMBER 1981 (18 MONTHS)

CODE	PROCEDURE	MAY 1980 FEE	NOV 1981 FEE
9023	Brief Visit	$ 5.00	$ 5.00
9025	Routine Visit	$11.00	$12.00 - $14.00
9026	Extended Visit	$14.00	$14.00 - $16.00
9030	Comprehensive Visit	--	$34.00
9071	Hospital Admission	$40.00	$40.00
9074	Hospital Followup	$12.00	$12.00
8885	Culture	$ 3.00	$ 5.00
9370	EKG	$15.00	$15.00
8700	Urinalysis	$ 1.00	$ 1.00
8368	Hemoglobin	$ 2.00	$ 2.00
	Average Charge/Office Visit	$16.93	$16.48

Comments:

There has been little change between 1980 and 1981 in the average charges or visits for patients with UTI, Otitis Media, or hypertension. There has been an increase in costs for bronchitis and diabetes patients, while a decrease in costs for anxiety patients. There was a decrease in ancillary charges for CHF patients while the visit charges increased.

AVERAGE OFFICE CHARGE PER PATIENT PER YEAR

FOR SELECTED DIAGNOSTIC GROUPS

	1980	1981
UTI		
Without Lab*	$27	$29
With Lab	$42	$42
# Visits	2.7	2.3
Bronchitis		
Without Lab	$25	$39
With Lab	$28	$41
# Visits	2.2	3.0
CHF		
Without Lab	$50	$62
With Lab	$76	$69
# Visits	4.3	4.6
Otitis Media		
Without Lab	$31	$30
With Lab	$33	$31
# Visits	2.9	2.7
Obesity**		
Without Lab		$49
With Lab		$55
# Visits		3.3
Diabetes		
Without Lab	$59	$87
With Lab	$67	$98
# Visits	5.2	6.3
Hypertension		
Without Lab	$47	$50
With Lab	$60	$61
# Visits	3.5	3.4
Anxiety		
Without Lab	$46	$35
With Lab	$54	$41
# Visits	3.9	2.6

*Lab denotes all ancillary charges.

**Diagnosis added for 1981 inter-practice comparisons.

Comments:

There was an increase in visit charges of 36% and ancillary charges of 13% for the average patient seen in 1981 as compared to 1980. An increase in charges was recorded for every age/sex group studied, the largest increase being for patients 75 and older.

AVERAGE OFFICE CHARGES PER PATIENT PER YEAR

FOR SELECTED AGE/SEX GROUPS

	1980	1981
All Patients		
Without Lab*	$28	$38
With Lab	$44	$56
# Visits	2.6	3.0
All Patients 3 - 8		
Without Lab	$21	$24
With Lab	$23	$26
# Visits	2.1	2.0
Males 15 - 19		
Without Lab	$15	$19
With Lab	$18	$24
# Visits	1.5	1.8
Females 50 - 55		
Without Lab	$32	$43
With Lab	$41	$66
# Visits	2.7	3.6
All Patients 75+		
Without Lab	$45	$58
With Lab	$58	$76
# Visits	3.8	4.4

*Lab denotes all ancillary charges.

II. INTER-PRACTICE VARIATION SUMMARY

Comments:

As in the 1980 year-end report, the COOP practices show great diversity in their patient characteristics and diagnoses seen. This is particularly evident in the percent of patients 65 and over which ranges from 6% to 64% of all patients. There is also substantial variation in the percent of patients covered by Blue Shield and Medicaid.

The variation in diagnoses seen primarily reflects the differences in ages seen. However, there are also some apparent differences in coding preferences as manifested by the variation in the ill-defined and examination categories.

VARIATIONS IN PATIENT CHARACTERISTICS

OCTOBER - DECEMBER 1981

PATIENT CHARACTERISTICS	LOWEST	SECOND LOWEST	MEDIAN	SECOND HIGHEST	HIGHEST	YOUR PRACTICE
% Female	53%	53%	58%	66%	67%	58%
% > 65	6%	9%	19%	42%	64%	22%
% Blue Shield	14%	23%	38%	45%	48%	39%
% Medicaid	0%	1%	6%	12%	13%	7%
% Pts. from town in which practice is located	13%	18%	46%	60%	72%	27%
DIAGNOSTIC CATEGORIES						
Ill-Defined	4%	4%	8%	21%	41%	4%
Examinations	1%	1%	15%	35%	39%	24%
Respiratory System	14%	14%	20%	28%	32%	14%
Circulatory System	5%	7%	14%	39%	51%	21%
Injury & Poison	2%	2%	5%	12%	13%	13%
Musculoskeletal	4%	4%	7%	18%	37%	6%

Comments:

This table in productivity variations shows the full range of diversity among the 23 COOP private practices examined. Some practices are relatively new with 30% and 40% of their office visits being from new patients. Some family practitioners spend a significant percent of their time doing obstetrics. One practice gets 47% of its total visit charges from hospital visits while another gets only 10%. The percent of office charges from lab varies from 2% to 25% (lab charges are billed independently in many practices). The coding of extended visits varies from approximately every third visit to extremely infrequent.

PRODUCTIVITY VARIATIONS -- 1981

	LOWEST	SECOND LOWEST	MEDIAN	SECOND HIGHEST	HIGHEST	YOUR PRACTICE
Office Visits/MD - PA*	2,254	2,276	3,088	5,587	5,769	5,769
New Patient Visits	2%	3%	9%	30%	40%	11%
Hospital Admissions/MD**	18	29	87	198	209	144
eliveries/MD**	21	45	57	79	80	57
Visit $ From Hospital Visits +	10%	11%	25%	36%	47%	19%
Office $ From Lab ++	2%	3%	7%	20%	25%	7%
atio Routine/Extended Visits	3.2	4.8	9.6	53.6	124.0	6.5
atio Routine/Brief Visits	3.1	3.2	8.6	24.9	25.4	14.1

*Estimated full-time equivalents; your practice = 1.0

**For those physicians performing deliveries or admissions only.

Hospital visit charges/(hospital visit plus office visit charges) -- see page 8.

Lab charges/(lab plus office visit charges) -- see page 3.

Comments:

Because all practices did not submit hospital data in 1980, 1980 - 1981 comparisons involving hospital charges or procedures have not been included. The median practice saw 5% fewer office patients in 1981. The percent of office charges from lab procedures changed relatively little. The median practice coded 13% more extended visits and 8% fewer brief visits.

INCREASES IN PRODUCTIVITY

1980 TO 1981

	LOWEST	MEDIAN	HIGHEST	YOUR PRACTICE
Office Visits/MD-PA	-11%	- 5%	+19%	- 5%
% New Patient Visits	-11%	- 2%	+ 2%	+ 1%
% Office $ From Lab	- 3%	+ 1%	+ 4%	0%
Ratio Routine/Extended Visit	-83%	-13%	+516%	+ 5%
Ratio Routine/Brief Visit	-63%	+ 8%	+62%	+10%

Comments:

There is a broad range of fees for each of the 12 procedures examined. It is generally true that a practice that is low or high for one procedure will be similarly low or high for all procedures. The average area income is an important determinant of fees.

There is more than a two-fold variation among these 23 private practices in the average charge per office visit. This variation reflects differences in:

(1) procedure fees
(2) procedure coding (e.g. routine vs. extended visit)
(3) use of ancillary procedures
(4) billing for ancillary procedures (e.g. three practices bill for x-rays)

VARIATIONS IN FEES AND AVERAGE CHARGE/OFFICE VISIT

NOVEMBER 1981

	LOWEST	SECOND LOWEST	MEDIAN	SECOND HIGHEST	HIGHEST	YOUR PRACTICE
Minimal Service	$ 5	$ 5	$ 7	$10	$12	---
Brief Visit	$ 5	$ 5	$12	$15	$16	$ 5
Routine Visit	$12	$14	$18	$21	$21	$14
Extended Visit	$15	$16	$25	$28	$35	$16
Comprehensive Visit	$30	$30	$48	$60	$70	$34
Hospital Admission	$35	$40	$60	$80	$100	$40
Hospital Followup	$12	$12	$20	$25	$30	$12
Lab Handling	$ 1	$ 2	$ 5	$ 8	$ 9	--
Culture	$ 3	$ 3	$ 5	$ 6	$10	$ 5
EKG	$15	$20	$29	$33	$35	$15
Urinalysis	$ 1	$ 2	$ 5	$ 9	$ 9	$ 1
Hemoglobin/Hematocrit	$ 2	$ 2	$ 4	$ 6	$ 7	$ 2
Average Charge/ Office Visit	$15.62	$16.48	$22.57	$28.11	$33.23	$16.48

Comments:

In the 18 months between May 1980 and November 1981, the median practice increased its routine visit fee $2.00 and increased its average charge per visit 10%.

INCREASES IN SELECTED PROCEDURE FEES
AND AVERAGE CHARGE/OFFICE VISIT
MAY 1980 - NOVEMBER 1981

CODE	PROCEDURE	LOWEST	MEDIAN	HIGHEST	YOUR PRACTICE
9020	Minimal Service	$0	+$1.00	+$10.00	--
9023	Brief Visit	$0	+$2.00	+$ 7.00	$0
9025	Routine Visit	$0	+$2.00	+$ 5.00	+$2.00
9025	Extended Visit	$0	+$4.00	+$12.50	+$1.00
9030	Comprehensive Visit	$0	+$5.00	+$15.00	--
8700	Urinalysis	-$2.00	$0	+$ 2.00	$0
8885	Culture	$0	+$1.00	+$ 2.00	+$2.00
9370	EKG	$0	+$4.00	+$ 6.00	$0
9800	Lab Handling	$0	$0	+$ 3.00	--
8366/8368	Hematocrit/Hemoglobin	$0	$0	+$ 2.00	$0
	Average Charge/Office Visit	-3%	+10%	+29%	-3%

Comments:

All 10 diagnoses examined showed large variations in the average office charges and visits per patient for 1981. The diagnosis with the highest number of visits per patient in the median practice was CHF with 4.6 visits and an average charge of $62 per patient. Otitis Media with 2.0 visits per patient at an average charge of $35 was the diagnosis studied with the lowest number of visits per patient in 1981.

AVERAGE OFFICE CHARGES AND VISITS PER PATIENT FOR 1981

FOR SELECTED DIAGNOSTIC GROUPS

	LOWEST	SECOND LOWEST	MEDIAN	SECOND HIGHEST	HIGHEST	YOUR PRACTICE
UTI						
Charges*	$24	$27	$41	$54	$56	$29
# Visits	1.7	2.2	2.5	3.2	3.7	2.3
Bronchitis						
Charges	$23	$29	$40	$68	$79	$39
# Visits	1.7	1.8	2.7	3.8	4.4	3.0
Pneumonia						
Charges	$33	$35	$50	$67	$84	--
# Visits	2.1	2.3	3.4	3.8	3.9	--
CHF						
Charges	$40	$44	$62	$98	$115	$62
# Visits	2.2	3.4	4.6	5.8	6.1	4.6
Otitis Media						
Charges	$16	$20	$35	$52	$76	$30
# Visits	1.3	1.4	2.0	3.3	4.4	2.7
Obesity						
Charges	$18	$27	$51	$74	$76	$49
# Visits	1.0	1.6	2.8	3.6	3.8	3.3
Diabetes						
Charges	$35	$38	$65	$85	$87	$87
# Visits	2.3	2.7	3.8	6.2	6.3	6.3
Hypertension						
Charges	$31	$39	$58	$75	$77	$50
# Visits	2.4	2.5	3.4	4.2	5.5	3.4
Anxiety						
Charges	$28	$30	$42	$73	$85	$35
# Visits	1.6	1.3	2.4	3.7	4.1	2.6
ASHD						
Charges	$43	$50	$69	$80	$94	--
# Visits	2.3	2.3	3.9	4.4	5.7	--

---

*Charges are visit charges only; all ancillary charges excluded.

Comments:

There is more than a two-fold variation in office charges for each age/sex group studied. The average patient in the median practice was charged $39 in 1981 and visited the office 2.6 times.

1981 AVERAGE *OFFICE* CHARGES AND VISITS PER PATIENT PER YEAR

FOR SELECTED AGE/SEX GROUPS

	LOWEST	SECOND LOWEST	MEDIAN	SECOND HIGHEST	HIGHEST	YOUR PRACTICE
All Patients						
Charges*	$26	$33	$39	$59	$59	$38
# Visits	2.2	2.3	2.6	3.1	3.4	3.0
All Patients 3 - 8						
Charges	$19	$23	$32	$45	$59	$24
# Visits	1.7	1.8	2.0	2.8	3.6	2.0
Males 15 - 19						
Charges	$16	$19	$29	$35	$36	$19
# Visits	1.4	1.5	1.8	2.5	3.4	1.8
Females 50 - 55						
Charges	$32	$32	$51	$73	$75	$43
# Visits	2.4	2.5	3.0	3.5	3.3	3.6
All Patients 75+						
Charges	$33	$37	$58	$75	$80	$58
# Visits	2.2	2.7	3.6	4.1	4.4	4.4

*Charges are visit charges only; all ancillary charges excluded.

Comments:

In examining the median increases in office charges and visits between 1980 and 1981 for these four chronic diagnoses, it is apparent that relatively little change occurred in the charges or practice style as evidenced by the revisit rate. The high extreme is quite easily rationalized by fee increases and changes in followup procedures. The low extreme, however, is difficult to rationalize in the aggregate. It basically represents two practices which changed either their treatment policies or their diagnostic coding policies. Although diagnostic coding varies considerably among physicians, it should vary little within a practice from year to year if the staff does not change.

1980 - 1981 INCREASE IN
AVERAGE OFFICE CHARGE AND VISITS PER PATIENT PER YEAR
FOR SELECTED DIAGNOSTIC GROUPS

	LOWEST	MEDIAN	HIGHEST	YOUR PRACTICE
CHF				
Charges*	-$33	+$ 9	+$25	+ $12
# Visits	-1.9	+0.1	+1.5	+ 0.3
Diabetes				
Charges	-$30	0	+$28	+ $28
# Visits	-1.7	0	+1.1	+ 1.1
Hypertension				
Charges	-$17	+$ 3	+$15	+ $ 3
# Visits	-0.8	-0.1	+0.7	-0.1
ASHD				
Charges	-$24	-$ 1	+$17	--**
# Visits	-1.7	-0.1	+0.4	--

---

*Charges are visit charges only; all ancillary charges excluded.

**Number of patients with this diagnosis too few to calculate.

Comments:

There was relatively little change between 1980 and 1981 in the average office charges and visits per patient for the five age/sex groups examined as evidenced in the median increases. The largest increase in average office charges per patient among these 23 practices was $10; the lowest was $3.

1980 - 1981 INCREASE IN

AVERAGE OFFICE CHARGES AND VISITS PER PATIENT PER YEAR

FOR SELECTED AGE/SEX GROUPS

	LOWEST	MEDIAN	HIGHEST	YOUR PRACTICE
All Patients				
Charges*	+$ 3	+$ 6	+$10	+$10
# Visits	-0.1	+0.1	+0.4	+0.4
All Patients 3 - 8				
Charges	-$ 3	+$ 3	+$ 4	+$ 3
# Visits	-0.6	-0.1	+0.3	-0.1
Males 15 - 19				
Charges	-$ 2	+$ 4	+$ 5	+$ 4
# Visits	-0.8	-0.2	+0.7	+0.3
Females 50 - 55				
Charges	-$ 3	+$ 9	+$18	+$11
# Visits	-0.9	+0.2	+0.9	+0.9
All Patients 75+				
Charges	-$ 2	+$ 8	+$15	+$13
# Visits	-0.4	+0.1	+0.6	+0.6

---

*Charges are visit charges only, all ancillary charges excluded.

EXHIBIT 5

KENNEBEC VALLEY
REGIONAL HEALTH AGENCY

8 HIGHWOOD STREET BOX 728 WATERVILLE, MAINE 04901
TEL. 873-1127

August 25, 1982

Ms. Mary Conrad
Coop Project
Dept. of Community and
Family Medicine
Dartmouth Medical School
Hanover, N.H. 03755

Dear Mary:

Flu season is fast approaching and we would like to get a special run made to identify potential flu vaccine recipients. Please list by site patient I.D. data for all patients seen within the past 12 months meeting one or more of the following criteria:

Age: 65 or over

and/or Dx:	COPD	ICHPPC =	492-
	ASCHD	"	415-
	Diabetes		250-
	Asthma		493-
	Heart Failure		4270-
	Malignant Neoplasm		150-

Please forward the ID lists directly to the Health Centers. Please label the reports: "Flu Vaccine Candidates."

Sincerely,

Nona

Nona O. Boyink
Division Administrator

NOB/sym

```
MADISON AREA HEALTH CENTER
FLU VACCINE CANDIDATES


NAME              INITIAL          D.O.B.          CHART #
----              -------          ------          -------


ADAM              B                051597          0852
ADAM              M                110505          5978
AGUR              J                091808          3605
ALDE              C                100810          9999
ALLA              H                082516          1674
ALLE              A                082909          0566
ALLE              E                092712          0937
ALLE              G                101906          2980
ALLE              H                080309          5420
ALLE              W                101210          4838
ALLE              W                101906          2980
ALWA              A                100482          6014
ALWA              A                121477          3507
AMEE              L                122809          9999
AMES              N                041305          1425
ANDR              L                112798          5969
ARRI              L                071207          5427
ARSE              E                080415          6174
BADG              D                042415          5489
BAHR              O                031217          1551
BAIR              C                112499          4368
BAIR              E                091200          4825
BAKE              R                062405          5389
BARK              C                021002          0706
BARR              R                112218          1917
BEAL              L                041891          5966
BEAN              G                082914          6250
BEAN              K                010804          2687
BEAN              V                071513          2375
BEAR              M                072692          4333
BEAU              M                091394          4697
BEDA              A                122815          5158
BELA              A                070438          3048
BERR              D                032613          2238
BERR              K                040710          1204
BERR              R                031976          4770
BERR              R                101420          2213
BETM              S                121108          4474
BILL              H                042104          2470
BISH              A                052326          6067
BISH              H                091501          0014
BISH              W                030422          0272
BLAS              E                042499          2304
BLIZ              C                010802          0867
BLIZ              M                012307          2795
BOLD              M                083007          5149
BOOT              H                122789          9999
BOUC              B                092505          4702
BOUF              W                071317          0899
BOYC              G                071536          0343
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EXHIBIT 6

EVALUATION OF A COMPUTERIZED BILLING SYSTEM FOR SMALL PRIMARY CARE PRACTICES

This presentation reports the results of a two-year study to evaluate the cost effectiveness of a computerized billing system in small primary care practices. The study was conducted by the Primary Care Cooperative Information Project (COOP Project),[1,2] a network of 50 primary care practices in northern New England working with Dartmouth Medical School faculty in the areas of clinical research, management research, quality assurance programs, and educational programs.

Five member practices in the COOP Project had elected to utilize the same computerized billing system beginning in the summer of 1980 and agreed to participate in a rigorous study which would evaluate its impact on the practices. This study was deemed extremely important by the COOP Project since, while extensive literature was available on recommended criteria for the selection of a computerized billing system,[3,4] unbiased evaluations of these systems once they are in place are not available in the literature and the claims of billing system vendors are elaborate but unsubstantiated by hard data.

The billing system selected by the five COOP practices was chosen after lengthy investigation into the alternatives. This system was found to be the most reliable and comprehensive at that time for a price that was affordable by these small practices. Specifically, the system selected was that developed by the Datamedic Corporation of

Long Island, New York. The "Datamedic system is designed around a custom-built micro-processor located in the practices. Billing information is entered into the micro-processor by practice staff. The micro-processor is then "polled" through an automatic phone call each night. The phone call takes about 20 - 40 seconds during which time the data entered during the day is transmitted to the central computer for processing and storage. At the time of the polling, the micro-processor's data base of active accounts is updated so the practice always has current on-line data on account balances with which to respond immediately to patient inquiries. Once a month, the bills and management reports are processed and mailed from Long Island. The management reports include a frequency and charge total for all procedures, a listing of the names, addresses, and phone numbers of all overdue accounts, and an aging of all private accounts. All five practices had chosen not to include the more expensive insurance forms-processing option since they were using Superbills which they felt were sufficiently cost-effective in that area.

The Datamedic system has the following advantages:

- low front-end hardware costs and reasonable monthly charges;
- reliability due to little downtime and experience of the central staff;
- backup computer storage of accounts;
- decentralized data entry maximizing accuracy and feeling of "control";
- centralized software maintenance and upgrading; and
- easier transition for staff since output and hardware problems are handled outside the office.

The original research design called for data collection for three months immediately before computer installation, and one year later. In addition, the five test practices were matched by size, speciality, and insurance assignment policy with five control practices where the same protocol was carried out over the first year period. Three of the original five experimental practices were solo physician sites; the other two employed three physicians.

Measuring the cost of billing involved determination of supply costs and staff time. Indicators of billing effectiveness included:

- collection ratio (charges/receipts);
- age of accounts receivables;
- billing accuracy;
- information available and its use in decision making;
- staff job satisfaction; and
- patient inquiries about bills.

Before and after the first year of computerized billing, billing staff kept a diary for one week of each study month to record time devoted to billing, logged all patient inquiries related to billing and completed a brief questionnaire on job satisfaction. All remaining data was collected by Dartmouth staff including a complete manual aging of all accounts for three months before computerization. Data collection instruments were developed in consultation with COOP clinic managers and behavioral science methodologists.

Because of the mixed results obtained after the first year's evaluation (some effectiveness indicators appeared to have improved; other results pointed to a billing system which was actually less effective), it was decided to continue the study in the computerized practices for a second year. Thus the diary, questionnaire, and A/R data were collected using the same methodology one and two years after the computer's introduction.

Results

The five control practices were matched with the computerized practices in terms of specialty, number of physicians and PA's, and insurance assignment policies. In spite of the similar number of providers, the control practices saw more patients. Three of the five computerized practices had admittedly disorganized billing systems and were not able to routinely complete their monthly billing cycles. All of the computerized practices utilized Superbills throughout the two year study period, while only one control practice had adopted this policy.

At the end of the first year, the average cost of billing had increased from $1.49/encounter before computerization to $1.98/encounter,* while the billing effectiveness indicators showed mixed results. At this time, which also coincided with the end of the terminal buy-back period,** two of the solo physician test practices and a third three-physician practice not participating in the study discontinued using the Datamedic Billing system. These practices believed that significant cost savings had not been realized and the billing staff indicated that more control over account status and personal contact with the patients were possible with the manual systems.

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*This figure does not include the capital cost of the micro-processor. For the largest and smallest (volume dependent) test sites, the costs are $710 (32K memory) and $195 (12K memory) respectively if the micro-processor was leased. If the hardware was purchased, the monthly costs are $58 and $110. These costs per encounter were calculated by Bernie and I leave it to him to describe the methodology he used and the results for the second year.

**Subsequent to this period of time, Datamedic would not repurchase its terminal from the practice and the practice was thus left with a unusable piece of equipment worth several thousand dollars.

Because of the elimination of two data points from the second year of evaluation, an additional solo practice, which had not participated in the first year's evaluation, was added to the study. Thus, the second year's evaluation results, where possible, are based on four practices. A detailed description of changes in each of the billing effectiveness indicators follows.

Staff Time Devoted To Billing

Table 1 shows changes in total billing time per visit and in percent of time spent on delinquent accounts over the two-year study period, spring 1980 - spring 1982. To obtain this information all billing staff had completed three week-long diaries in each of the three months of each data collection period. These weeks each represented different times during the month (e.g. the first, third, and four weeks). The diaries had every half-hour of the day blocked out and the billing staff recorded approximately what portion of each of these half-hours were spent in billing under six specific tasks. Even though these six tasks were carefully defined, due to differences in billing organization, only the definitions of total time and delinquent billing time were determined to be standard enough to use in the final comparison. One year after the pre-computer data collection period, the total billing time per visit (sum of all staff billing time) had decreased in four of the five control practices while increasing in four of the five computerized practices, this in spite of a higher average collection rate at the time of visit in the computerized practices. (See Table 4). The one computerized practice where total billing time per visit decreased had added an office laboratory after the 1980 data collection and it is likely that billing for lab only visits is a relatively shorter process. The increase in time to the computerized practices revealed by the diary totals was not a surprise to many disappointed staff members who knew it was taking them longer to do their jobs.

TABLE 1

STAFF TIME DEVOTED TO BILLING

	TOTAL BILLING TIME/VISIT (MIN)			PERCENT BILLING TIME ON DELINQUENT ACCOUNTS		
CONTROL PRACTICES	1980	1981		1980	1981	
PRACTICE A	11.25	7.8		10%	8%	
PRACTICE B	11.2	10.2		9%	4%	
PRACTICE C	15.7	12		15%	18%	
PRACTICE D	14.7	14.6		16%	16%	
PRACTICE E	10	10.4		4%	4%	
COMPUTERIZED PRACTICES	1980	1981	1982	1980	1981	1982
PRACTICE A	15.7	18.8	14.8	9%	21%	18%
PRACTICE B	11.2	10.6	9.8	3%	5%	4%
PRACTICE C	13.4	13.7	--	9%	10%	--
PRACTICE D	11.3	12.5	--	3%	2%	--
PRACTICE E	15.4	15.8	14.0	3%	7%	5%

Table 3 shows where some of this increased billing time was spent, as the average number of billing inquiries logged before and after computerized billing had increased in some practices. There was no major change for the control practices in average number of billing inquiries per week in spite of an increase in patient volume. Those computerized practices accepting assignment had experienced most of the increases in the number of billing inquiries, particularly in the area of explanation of charges. This was largely due to the particular inability of this billing system to match payment with the correct date of service on the bill sent to the patient after the insurance billing.

TABLE 3

BILLING INQUIRIES

TOTAL AVERAGE NUMBER OF INQUIRIES/WEEK BY CATEGORY

	CONTROL PRACTICES	
	1980	1981
EXPLANATION OF CHARGES	10	12
INSURANCE PROBLEM	16	14
DELINQUENT ACCOUNT	3	2
BILLING ERRORS	1	1
TOTAL	30	29

	COMPUTERIZED PRACTICES			
	ASSIGNMENT*		NON-ASSIGNMENT	
	1980	1981	1980	1981
EXPLANATION OF CHARGES	6	18	3	4
INSURANCE PROBLEM	8	6	3	3
DELINQUENT ACCOUNT	2	6	1	1
BILLING ERRORS	1	2	0	0
TOTAL	17	32	7	8

In 1982, however, there was a significant decline in total billing time per visit for all three practices studied. As shown in Table 2 two practices increased their number of physicians with no staff increase, while the third did not replace a full-time staff member who left the practice. In two practices the review of the billing process necessitated by the computer's introduction resulted in a negative personnel evaluation and a change in the individuals hired for billing.

From 1980 to 1981 the change in percent of billing time devoted to delinquent accounts varied in both control and computerized practices as shown in Table 1. One computerized practice registered a 12% increase; the only practice recording a slight decrease was the practice already having the highest percent of payment at the time of visit. By 1982 the three practices studied showed a slight decrease in time spent on delinquent accounts as compared to the previous year's increases. However, the effectiveness of the time spent post-computerization was undoubtedly considerably higher due to the conveniently tabulated names, addresses, and phone numbers of all delinquent accounts.

TABLE 2

	FTE BILLING STAFF*			FTE MD'S		
	1980	1981	1982	1980	1981	1982
PRACTICE A	.97	1.14	1.36	1	1	2
PRACTICE B	1.5	1.5	1.2	3	3	3
PRACTICE E	3	3	2.6	3	3	4

*FTE Staff = 37.5 hours/week spent on billing as recorded in the diary.

Age of Accounts Receivable

The age of accounts receivable was obtained manually for all ten practices before computerization and for the control practices only one year later. The age of accounts under the computerized billing system was recorded from the monthly management reports. Similarly payment at the time of visit was either calculated from the monthly log or reported as documented in the Datamedic reports.

While the control practices varied in the direction of their change in the percent of total outstanding accounts over 90 days, Table 4 reveals that all five of the computerized practices decreased the percent of accounts over 90 days between 1980 and 1981. Since there were no major changes in the collection policies, this finding is consistent with a tightening up of the delinquent account handling made possible by the computer-generated list of overdue accounts. Payment at the time of visit which decreased in three of the five control practices over the first year, increased significantly in only one of the computerized practices.

TABLE 4

PERCENT TOTAL ACCOUNTS RECEIVABLE > 90 DAYS
AND PAYMENT AT TIME OF VISIT*

	% TOTAL AR>90 DAYS		% PAYMENT AT TIME OF VISIT	
CONTROL PRACTICES	1980	1981	1980	1981
PRACTICE A	39%	40%	46%	47%
PRACTICE B	32%	25%	10%	5%
PRACTICE C	24%	33%	35%	25%
PRACTICE D	38%	32%	18%	14%
PRACTICE E	37%	41%	18%	22%
COMPUTERIZED PRACTICES	1980	1981	1980	1981
PRACTICE A	48%	45%	44%	45%
PRACTICE B	54%	42%	21%	25%
PRACTICE C	52%	47%	42%	40%
PRACTICE D	39%	36%	52%	63%
PRACTICE E	43%	42%	7%	9%

---

*Median over each three month period.

Days of Outstanding Accounts Receivable

The computer's impact on outstanding accounts receivable is depicted in Table 5 for all seven of the practices using the Datamedic billing system. Four of the seven computerized practices increased their days of outstanding accounts receivable in 1981. Because the accounts receivable over 90 days has also decreased relative to the total, the majority of practices experienced an increased volume of more quickly paid (especially private) accounts. In 1982 two of the four practices which had initially experienced an increase in total A/R (Practices E and G) were showing a decrease in outstanding accounts in comparison with 1981. The continuing high level of outstanding accounts in several practices was a surprise and was ultimately explained by the fact that automation had caused the infusion of a great many "deadbeat" accounts and encouraged less frequent bad debt writeoffs.

TABLE 5

DAYS OF OUTSTANDING ACCOUNTS RECEIVABLE*

CONTROL PRACTICES	1980	1981
PRACTICE A	69	84
PRACTICE B	58	55
PRACTICE C	27	42
PRACTICE D	77	62
PRACTICE E	94	76

COMPUTERIZED PRACTICES	1980	1981	1982
PRACTICE A	83	95	97
PRACTICE B	98	94	84
PRACTICE C	85	67	--
PRACTICE D	42	40	--
PRACTICE E	55	79	73
PRACTICE F	67	83	--
PRACTICE G	93	98	86

---

*Days = Total accounts receivable/average daily charge (median of three months).

Collection Ratio

Table 6 shows the changes in the collection ratio for the computerized practices over the two year study period. This indicator was the major tip-off that billing effectiveness might be improving after the first year, because collections had either remained the same or improved in all practices even while total outstanding accounts had increased in many cases. This data was obtained from the Datamedic management reports.

TABLE 6

COLLECTION RATIO*

COMPUTERIZED PRACTICES

	1980**	1981	1982
PRACTICE A	.72	.72	.84
PRACTICE B	.69	.81	.87
PRACTICE C	.89	1.00	--
PRACTICE D	.86	1.10	--
PRACTICE E	.82	.86	.88
PRACTICE F	--	--	--
PRACTICE G	.75	.90	.79

---

*Total payments/total charges

**1980 figures are not pre-computerization but first five months (August - December) after computerization since comparable pre-computer data was not available for all practices; 1981 and 1982 figures are five month medians of January - May data.

Staff Evaluations

Table 7 summarizes selected aspects of the staff evaluations as reported in the questionnaires. In 1981 approximately one year after the computer's installation the billing staff were largely (91% and 86%) satisfied with their jobs. However, because only 21% of the billing staff in the computerized practices initially liked the way billing was organized as opposed to 78% in the control practices, it is apparent that there were more attitude problems to be overcome in the computerized practices. The jump to 55% liking the way billing was organized subsequent to the computer's installation was the largest recorded change in attitude, and yet it also reveals that almost half of the staff are still dissatisfied.

Only 25% of the staff in the computerized practices felt their job had not changed after one year. Two years later while all the staff were satisfied with their job activities, only 63% liked the way the billing process was organized.

TABLE 7

STAFF EVALUATIONS

PERCENT OF RESPONDENTS AGREEING WITH SELECTED STATEMENTS

CONTROL PRACTICES	1980	1981	
Job would not change with computer	45%	45%	
Current system produces professional-looking bills	78%	73%	
Like way billing is organized	78%	73%	
Satisfied with job activities	91%	82%	
Number of respondents	23	23	
COMPUTERIZED PRACTICES	**1980**	**1981**	**1982**
Job would not/did not change with computer	14%	25%	14%
Current system produces professional-looking bills	64%	92%	100%
Like way billing is organized	21%	55%	63%
Satisfied with job activities	86%	91%	100%
Number of respondents	14	12	9

The computerized billing system was designed to eliminate the perceived weaknesses of a manual billing system, and indeed, these weaknesses had become the strengths of the computerized system. However, as shown in Table 8, from the staffs' perspective, new weaknesses had been substituted for the old weaknesses with the computerized system. The relative weight of these new and old weaknesses is something prospective buyers of the computerized billing system will have to consider. Two years after the introduction of computerized billing, the staff had not reconciled themselves to the system's shortcomings in that the perceived weaknesses remained the same as in 1981. Staff members in one of the four remaining practices still wished to return to a manual system.

TABLE 8

STAFF EVALUATION OF MAJOR STRENGTHS AND WEAKNESSES OF BILLING SYSTEM COMPUTERIZED PRACTICES

	STRENGTHS	WEAKNESSES
1980 (MANUAL BILLING)	* Use of Superbill * Collection at time of visit * Individual handling of accounts	* Unprofessional looking bills * Lack of time for monthly billing * Lack of time for delinquent accounts * Legibility of handwritten ledger cards
1981 & 1982 (COMPUTERIZED BILLING)	* Professional looking bills * Regular monthly billing * Delinquent accounts report	* Balance forward accounting only (lack of itemized bill for insurance patient on other than first bill) * Unavailability of birth dates * Lack of insurance aging * Increase in time to answer billing inquiries (complete history not available in one location) * Accounting not on calendar month basis * Limited number of procedure codes * Time lapse up to one month for documentation of account balance

Information Available

The amount of information availalbe increased markedly in the computerized billing practices as shown in Table 9. Aside from the hoped-for cost savings in personnel time and reduced accounts receivable, this is the primary motivation behind the purchase of a computerized billing system. All of the computerized billing practices were satisfied with the feedback reports provided (except for problems with "billing period" month), especially the delinquent account listings and charges, receipts, and adjustments by selected categories. It is apparent that more information was available than was effectively used for decision-making, however. In fact, in 1981 the patient recall capacity and the computerized option for budget plans were not being utilized by any of the five study practices and special letters were still being handled manually by two practices. By 1982, the information available was being utilized much more effectively with examples given by the practice administrators such as fee setting and salary apportionment by workload. Administrators responded that an average of one to three hours per month were spent in 1982 reviewing the computer's financial reports. In the second year all four practices had experimented with date charges, budget plans, or specialized letters.

TABLE 9

TOTAL NUMBER OF PRACTICES WITH

SELECTED INFORMATION ROUTINELY AVAILABLE

	CONTROL PRACTICES		COMPUTERIZED PRACTICES	
	1980	1981	1980	1981
TOTAL DAILY CHARGES	5	5	5	5
TOTAL DAILY RECEIPTS	5	5	5	5
TOTAL MONTHLY CHARGES	5	5	5	5
BY PROCEDURE	0	0	0	5
BY DEPARTMENT	3	3	0	5
BY PHYSICIAN/PA	2	2	2	5
TOTAL MONTHLY RECEIPTS	5	5	5	5
BY INSURANCE CATEGORY	2	2	3	5
TOTAL MONTHLY ADJUSTMENTS	5	5	5	5
BY CATEGORY	2	2	3	5
DELINQUENT ACCOUNTS LISTING WITH ADDRESS AND PHONE NUMBER	1	1	0	5
TOTAL ACCOUNTS RECEIVABLE	5	4	4	5
BY PRIVATE/OTHER	0	0	0	5
AGING OF PRIVATE/AR	0	0	0	5
RECALL LISTS	3	3	0	5*

Billing Accuracy

It is promulgated by the marketers of computerized billing systems that these systems will reduce the lost charges inherent in a manual billing system as manifested by lost or misplaced ledger cards and arithmetic errors. To obtain these figures a random list of 500 patients recorded on the day sheets of each study month were searched for and the COOP Project feedback reports were examined (See reference 1) for charge descrepancies. While these problems were reduced in the computerized billing practices ad demonstrated in Table 10, our research revealed these sources of inaccuracies to be relatively small in the ten practices studied. It is also important to note that registration errors, which are comparable to lost ledger cards, are not eliminated in a computerized billing system.

TABLE 10

BILLING ACCURACY

CONTROL PRACTICES	1980	1981
TOTAL PERCENT OF LEDGER CARDS NOT LOCATED	9%	1%
TOTAL PERCENT OF DISAGREEMENT BETWEEN TOTAL CHARGES AND SUM OF PROCEDURE CHARGES	NA	NA
COMPUTERIZED PRACTICES	**1980**	**1981**
TOTAL PERCENT OF LEDGER CARDS NOT LOCATED	16.5%	4.7%*
TOTAL PERCENT OF DISAGREEMENT BETWEEN TOTAL CHARGES AND SUM OF PROCEDURE CHARGES	2.6%	0%

---

*Total percent of mismatch bills >3 months; total percent in both accuracy indicators refers to the median sum of indicators for all five practices over a three month period.

Conclusions

The first observation one proffers from a study such as this is that the billing process itself varies tremendously from practice to practice, as much as the collective personalities it reflects. This variation in billing "style" was evident in every criteria examined, for example, the 2% to 21% of billing time spent on delinquent accounts. Thus, the impact of a computer is even one more order of magnitude broader than this already enormous range. Some important conclusions which can be drawn, however, are the following:

1. The test practices as a whole were not as "successful" as the control practices in terms of patient volume, staff satisfaction, or being able to meet the monthly billing deadline in spite of some advantages such as use of the Superbill and COOP Project management consultation.
2. In all but one of the five initial test practices the introduction of the computer was responsible either for changing the number of billing staff or the individuals involved.
3. The decrease in staff time and improvement in the collection ratio and use of the management reports did not occur for almost a year after introduction of the computer, before which three of seven practices had decided to discontinue its use.
4. The reasons for persevering with the computer were not related to cost-savings. Two of the practice's physician-administrators were simply "computer-oriented" while the other two had used it to improve the organization of

their billing process. Table 11 delineates the major reasons for which all seven Datamedic practices either continued or discontinued use of the computer after the first year.

TABLE 11

MAJOR REASONS FOR WHICH SEVEN PRACTICES EITHER CONTINUED OR DISCONTINUED COMPUTERIZED BILLING AFTER ONE YEAR

REASONS FOR DISCONTINUATION		REASONS FOR CONTINUATION	
PRACTICE C	Too Costly Decrease in ability to handle accounts on individual basis	PRACTICE B	Meeting monthly deadline for sending out bills
PRACTICE D	Too Costly High payment at time of visit and low number of insurance accounts resulted in efficiency which could not be improved	PRACTICE E	Meeting monthly deadline for sending out bills
PRACTICE F	Too Costly Low level of control with insurance accounts Disagreements on utility among partners	PRACTICE A	Likes management reports for decision making input
		PRACTICE G	Likes management reports for decision making input

The results of the two year study to evaluate the cost-effectiveness of the Datamedic computerized billing system for small primary care practices are summarized in Table 12. While after two years the effectiveness of the billing system had improved by many criteria for the test practices as a whole, the improvement in many cases was only slight and this measured level of effectiveness (magnitude of improvement from 1980 to 1981) was still matched by a manual system, i.e. at least one of the control practices. The area showing the greatest promise for increased and perhaps unmatchable cost-savings was in staff time and that is something the COOP Project will continue to follow in the four remaining Datamedic practices through the third year post-computerization. If the computerization were to extend to insurance forms processing, the time savings might be even greater (although the cost also would be greater).

Practice administrators endeavoring to improve their billing effectiveness should not regard computerized billing as a panacea, but rather as a tool for a carefully researched billing process. One to four physician practices contemplating the purchase of a computer for billing should have additional reasons for this purchase in the short run e.g., the desire to use the computer for word processing, clinical studies, accounting, continuing medical education, etc. and should purchase a computer which can accommodate both billing and their other interests.

TABLE 12

EVALUATION SUMMARY AFTER ONE YEAR AND TWO YEARS

DID THE COMPUTERIZED BILLING...	ANSWER		METHODOLOGY
	1981	1982	
Result in more time spent on delinquent accounts?	Yes	Yes	Diary
Make receivables younger?	Yes	Yes	Aging
Increase job satisfaction?	Yes	Yes	Questionnaire
Improve billing organization?	Yes	Yes	Questionnaire
Increase accuracy?	Yes	NA	Ledger Search/COOP Reports
Increase information?	Yes	Yes	Report Listing
Increase collection ratio?	Yes	Yes	Computer System Reports
Reduce patient inquiries?	No	NA	Log
Increase payment at time of visit?	No	NA	Day Sheet Totals
Reduce days of outstanding accounts receivable?	No	Yes	Aging
Reduce personnel time?	No	Yes	Diary

EXHIBIT 7

COOP DATA SYSTEM

I. OBJECTIVES:

A. TO IMPLEMENT AN EFFICIENT AND COST EFFECTIVE MEDICAL OFFICE INFORMATION SYSTEM THAT WILL FULLY SUPPORT THE FOLLOWING FUNCTIONS:

- Accounts Receivable and Billing
- General Ledger
- Accounts Payable
- Clinical Data Base
- Appointment Scheduling
- Word Processing

B. TO IMPLEMENT THE MEDICAL OFFICE INFORMATION SYSTEM IN A HARDWARE ENVIRONMENT WHICH WILL NOT EXCEED $10,000. THE MINIMUM CONFIGURATION FOR A SOLO PHYSICIAN MIGHT BE:

- CPU (64K RAM min.)
- Monitor
- Printer
- Disk Storage (2.2 MB min)
- Back-Up Capability

C. TO PROVIDE THE COOP PROJECT A MINIMUM DATA SET FOR ALL ON-SITE PATIENT ENCOUNTERS.

EXHIBIT 8

EXISTING SOFTWARE SYSTEMS
REVIEWED BY COOP

1. SOFTCARE by Professional Business Software,Inc.

2. PROSOFT by Professional Medical Software,Inc.

3. MEDOFFICE by Patient Care Data Systems,Inc.

4. DATAMEDIC by Datamedic Corporation

5. PHYSICIANS MIS by Medical Office Systems, Inc.

6. MEDICAL OFFICE MANAGEMENT SYSTEM by Health Data Products, Inc.

7. MEDPAC by Management Systems of Roanoke, Inc.

EXHIBIT 9

VENDOR	SOFTCARE	MOMS	PROSOFT	MEDOFFICE	PHYSICIANS MIS	DATAMEDIC	MEDPAC
1. HARDWARE	APPLE II PLUS (VECTOR GRAPHICS)	ALTOS 8000	APPLE II	ALTOS 8000	APPLE II	DATAMEDIC 5000	APPLE II
HARD DISK	YES 10 MB	YES 10 MC	YES 5 MB	YES 10 MB	YES 5 MB	YES 10 MB	YES 10 MB
FLOPPY DISK	NO	NO	NO	YES 8" DS-DD	YES 5¼"	NO	YES 8" DS-D
2. COST HARDWARE	$12,000	$9,600	$9,100	$9,600	$9,100	$12,000	$9,100
SOFTWARE	$ 1,995	NONE		$4,500/$3,500	$2,500	MONTHLY FEE	$2,500/$1,8
3. PERFORMANCE							
A. Family Billing	NO	YES	YES	YES	YES	YES	YES
B. Open Item Acct	3rd Qtr 83	4th Qtr 82	NO	NO	NO	NO	NO
C. Account Coding	YES	YES	NO	YES	NO	YES	NO
D. Auto. Late Notes	YES	YES	YES	YES	YES	YES	YES
E. Private Aging	YES	YES	YES	YES	YES	YES	YES
F. Ins. Aging	YES	YES	NO	YES	NO	YES	NO
G. Delq. Acct. List	YES	YES	YES	YES	YES	YES	YES
H. Pract. Mang. Rpt.	YES	YES	YES	YES	YES	YES	YES
I. Clinical Reports	YES	YES	NO	YES	NO	NO	NO
J. Ins. Claims	YES	YES	YES	YES	YES	YES	YES
4. SCORE	12	10	6	9	6	8	6

ALTOS COMPUTER
PRICE RANGE

	8000-5	8000-10 & TAPE	8000-10 & FD
MICROPROCESSOR	64K	64K	64K
	5 MBYTE & .5 MB	10 MBYTE & TAPE	10 MBYTE
	FLOPPY BACK-UP	BACK-UP	8" DS-DD FLOPPY
	$5,000	$7,700	$6,100
CRT TELEVIDEO 910	550	550	550
PRINTER & INTERFACE	1,000	1,000	1,000
CPM SOFTWARE	100	100	100
	$6,650	$9,350	$7,750

APPLE II PLUS

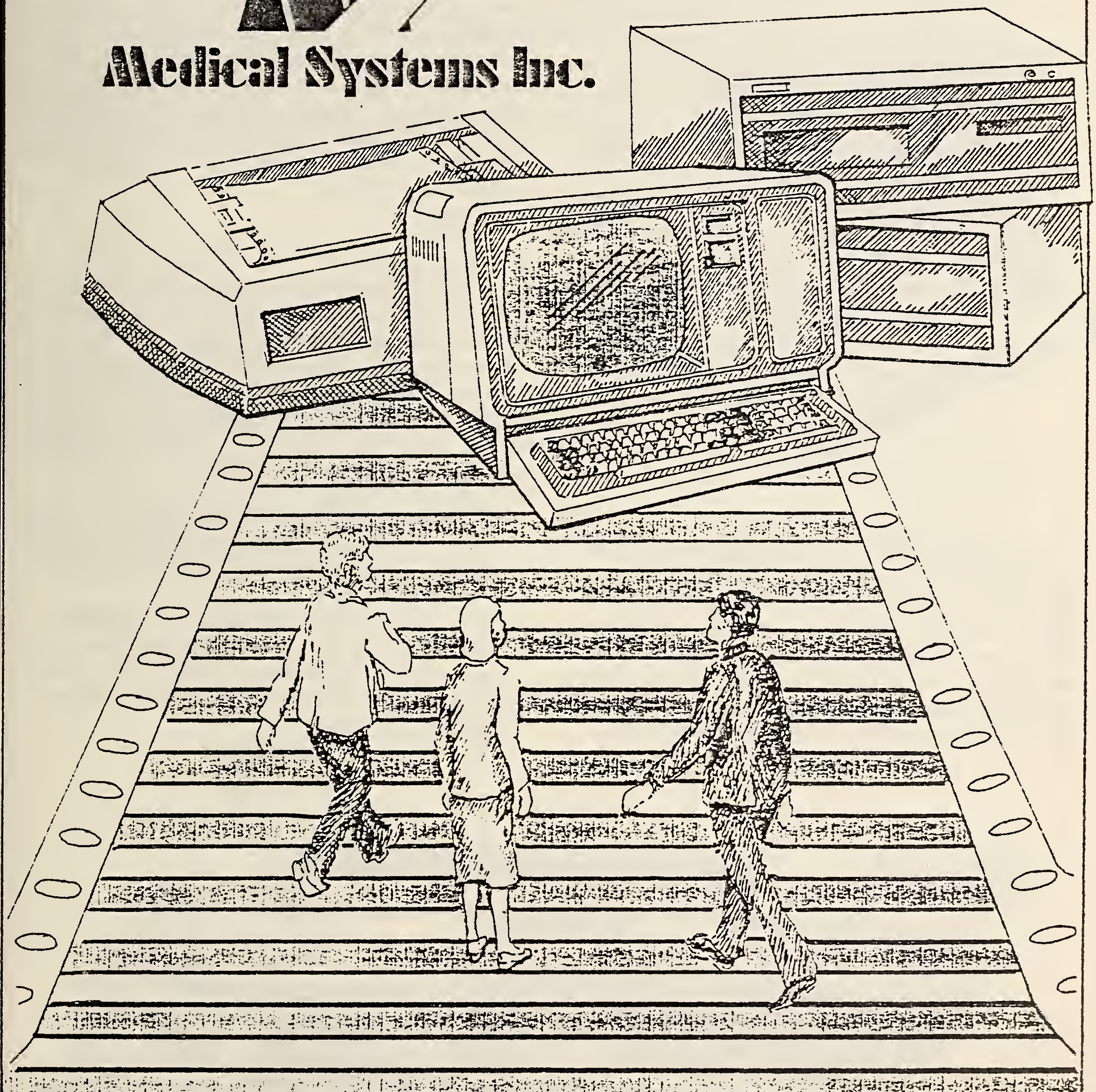
MICROPROCESSOR & 64K MEMORY	$1,725
B & W MONITOR (TV SCREEN)	150
80 COL CARD	345
PRINTER & INTERFACE	1,259
5 MBYTE HARD DISK	3,100
VIDEO TAPE BACK-UP	1,450
CPM SOFTWARE	500
	$8,529

FD = Floppy Disk

DS-DD = Double sided, double density disk

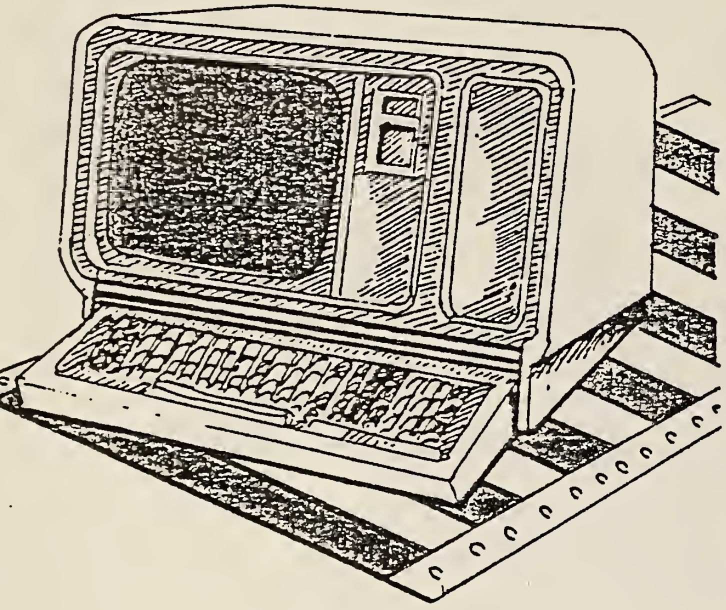
EXHIBIT 10

Medical Systems Inc.



THE MEDICAL OFFICE MANAGEMENT SYSTEM

A Complete, Low-Cost Automated System for Clinic Accounting, Billing, Information Management and External Reporting



The Medical Office Management System (MOMS) brings the benefit of modern, low-cost data processing to small and medium-sized clinics and the private practice. Because of its low cost and adaptability for reporting, it is especially attractive to those clinics receiving external support or requiring additional data collection/monitoring.

MOMS is well-suited to any practice that does a significant amount of patient or third-party billing, and that needs accurate, up-to-date management information. It is a complete, integrated, easy-to-use computer system that automates many time-consuming and expensive administrative functions.

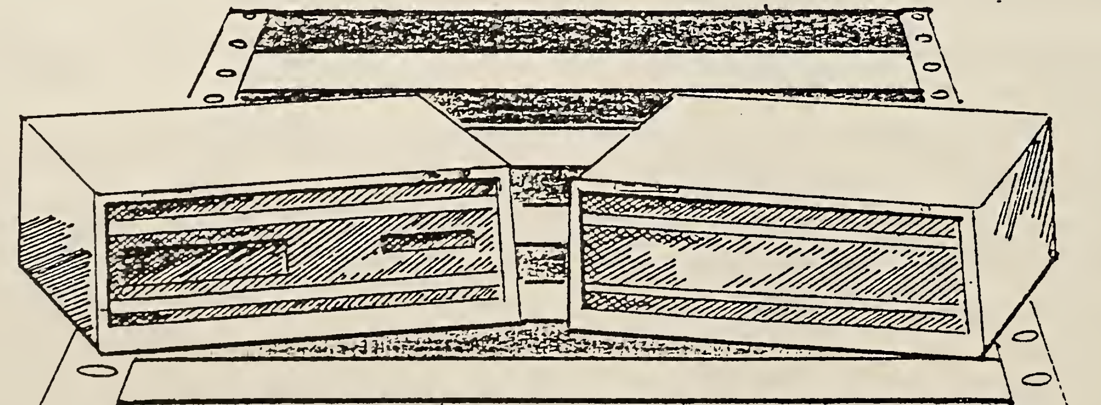
Medical Systems, Inc. has produced a data system that is

effective
reliable
inexpensive

and requires no knowledge of computers, no special facilities, and no special skill on the part of the staff who will use it.

An important consideration in the purchase of a computer system is: **How reliable is maintenance of the hardware?** After much effort, Medical Systems, Inc. has made available three (3) options for the customer's choice:

- An agreement with Health Data Products utilizing remote phone diagnosis and a 48-hour "swap-in" "swap-out" of defective equipment.
- An agreement with Moore Business Machines, a national repair service.
- No direct agreement with MSI. The customer contracts with the repair service of its choice.



Unlike many computer systems, MOMS does not try to be all things to all people. It was developed specifically to be affordable, and therefore does not have some of the "bells and whistles" that some of the larger or more expensive systems have. Its primary design goals are:

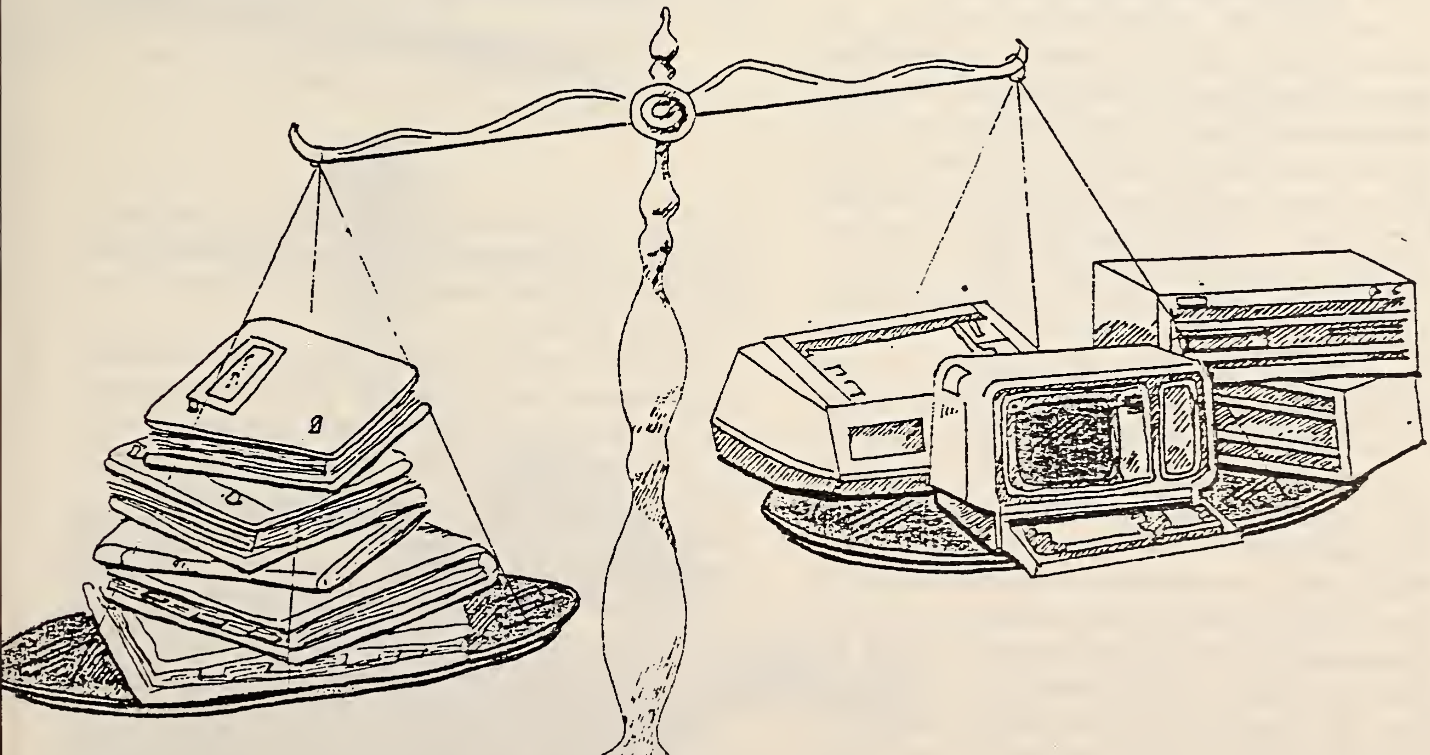
low cost
long life
ease of use
maximum benefit per dollar

Its main function is to relieve the clinic administrative staff of many of the routine burdens of running a medical practice, while at the same time improving operational efficiency, increasing revenue production, and simplifying the process of external reporting.

MOMS is a "stand-alone turnkey" system which means it is self-contained, that it comes complete with the necessary programs (software), and that it needs only to be plugged into a standard electrical outlet to be fully operational. MOMS is an easy-to-use solution to information-handling problems, not just a collection of hardware that requires an expert to use it.

The "core" of MOMS consists of five major modules. Four of these form the accounting system: Accounts Receivable (which includes all types of billing); Accounts Payable; Payroll; and General Ledger. The Quality Assurance module completes the basic system.

It is important to understand that although the core modules perform separable functions, they are fully integrated so that they can use each other's data without requiring repetitive data entry. This is a major contribution to speed and accuracy, and is a feature not often found in small computer systems.



The Accounts Receivable module is the largest and most important single part of the MOMS core system. It is designed around a family-account structure, which means that it can generate a single integrated statement for a family, instead of generating separate bills for each family member. A person's account is accessed either by the patient's name or by account and patient numbers. Balances are kept for the individual patient as well as for the family.

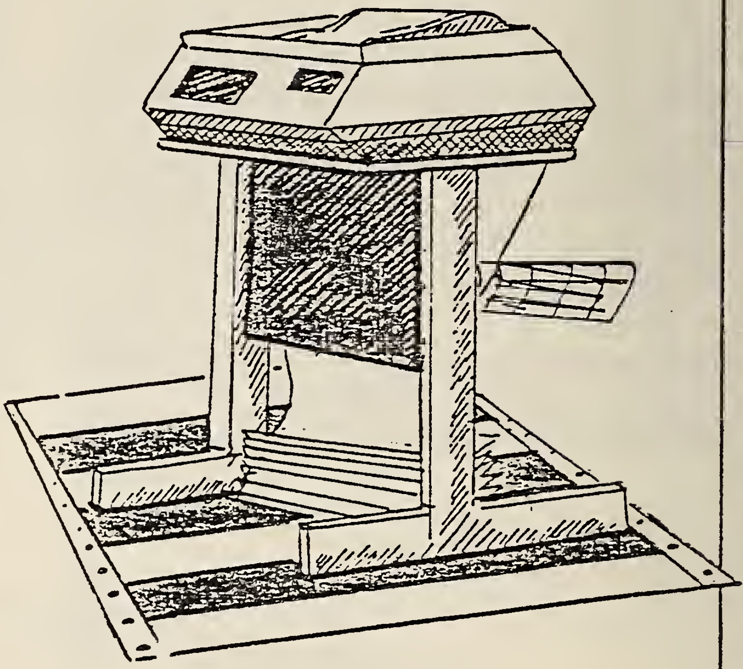
The system collects all the information necessary to print family statements and third-party insurance or claim forms. Claim forms for individual patients are automatically prepared for submission to primary insurance carriers or intermediaries. In addition, the system is capable of printing the forms required to bill secondary carriers when the primary carrier does not reimburse the clinic for the total amount of services rendered. Delinquency notices are automatically printed on statements when appropriate. Custom messages from the clinic can also be printed on the bill, either for all patients' bills or for specific patients.

A number of receivables reports are routinely generated by the receivables module. These include a listing of all delinquent accounts, a detailed breakdown of the services rendered by each provider, and a listing of the month-to-date and year-to-date distribution of charges, receipts and adjustments for each payment source. This information is also fed to the Quality Assurance module.

The Accounts Payable module is an invoice-linked system with flexible check calculation. It allows the user to choose a set of vendors whose invoices will be paid and whose credit memos will be applied automatically.

The Payroll module accommodates any of the four most common pay periods: monthly, semi-monthly, weekly or bi-weekly. Taxes are computed on the total amount accumulated during the pay period and then deducted. Miscellaneous deductions can be withheld on either a recurring basis or only once. Cumulative records provide the data for printing the payroll journal, government tax forms and other externally required reports.

The General Ledger module is a standard double-entry, single-input package. It is fully integrated with the other modules so that multiple data entry is not required. The system does not permit unbalanced transactions to be posted to the General Ledger. A number of financial reports are generated, including trial balance, income statement and balance sheet.



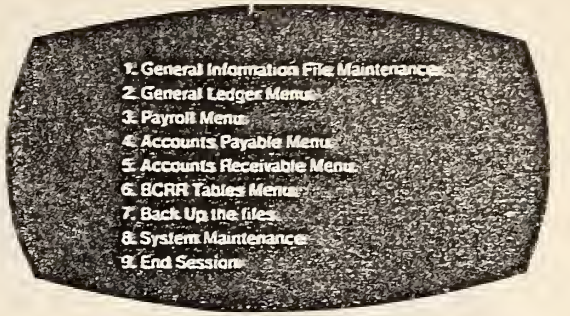
The aim of the Quality Assurance module is to enable the physician and other medical staff to identify those patients in need of continued care or periodic tests. The immunization status of all pediatric patients is monitored by the system. Adult female patients are monitored to insure that each receives Pap/pelvic examinations on a regular basis. A chronic disease registry is established and systematically up-dated by the system. All three of these submodules can generate recall reports, using criteria defined by the clinic.

A MOMS user communicates with the system through the CRT, which resembles a small television set with an attached typewriter. The system is menu-driven, which means the operator is presented with a list of options on the screen, and simply chooses the function to be performed. As you know, the more sophisticated the software, the easier it is to use. With MOMS, the instructions are always in front of the operator and the system prompts the user when to select an option or enter information.

MOMS' use of the cursor makes the system easy to use by letting the user know where the next entry is to be made. The system moves the cursor itself so the user will always enter the information at the correct place. MOMS is capable of detecting a large number of input errors; when errors are detected, the system alerts the operator, shows the nature of the error, erases the mistake, and positions the cursor at the correct re-entry point.

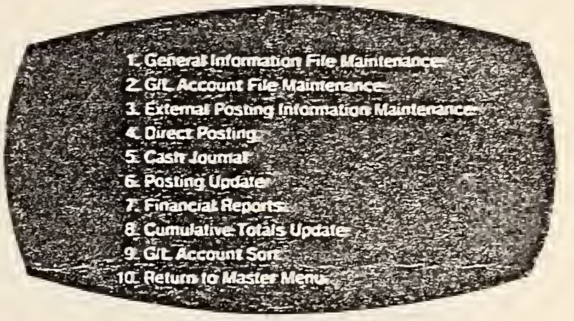
When initially turned on, the system greets the operator with a request for the current date. The Master Menu is then displayed for the user to decide which module is to be selected (Figure 1). The system will then display additional menus to lead the operator through the required steps. This feature assures that there is no way for the user to get "lost." At each level, the user is given easy-to-use options (as opposed to "loading" the programs). For example, if General Ledger is selected the next display is the G/L Menu (Figure 2).

After all necessary choices have been made, the system presents the user with the appropriate data-entry screen. This consists of a display of all the data items that need to be entered, followed by a series of dots indicating where the entry will be made (Figure 3).



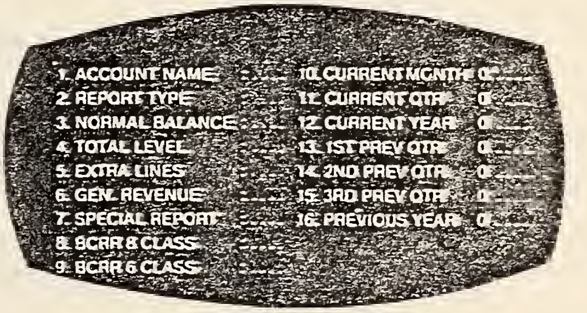
```
1. General Information File Maintenance
2. General Ledger Menu
3. Payroll Menu
4. Accounts Payable Menu
5. Accounts Receivable Menu
6. BCRR Tables Menu
7. Back Up the files
8. System Maintenance
9. End Session
```

FIGURE 1



```
1. General Information File Maintenance
2. G/L Account File Maintenance
3. External Posting Information Maintenance
4. Direct Posting
5. Cash Journal
6. Posting Update
7. Financial Reports
8. Cumulative Totals Update
9. G/L Account Sort
10. Return to Master Menu
```

FIGURE 2



```
1. ACCOUNT NAME      ...   10. CURRENT MONTH    0....
2. REPORT TYPE       ...   11. CURRENT QTR      0....
3. NORMAL BALANCE    ...   12. CURRENT YEAR     0....
4. TOTAL LEVEL       ...   13. 1ST PREV QTR     0....
5. EXTRA LINES       ...   14. 2ND PREV QTR     0....
6. GEN. REVENUE      ...   15. 3RD PREV QTR     0....
7. SPECIAL REPORT    ...   16. PREVIOUS YEAR    0....
8. BCRR 8 CLASS      ...
9. BCRR 6 CLASS      ...
```

FIGURE 3

ACCOUNTS RECEIVABLE

General Structure

- Family account structure (family bill)
- Patient lookup by name or account number
- Account and patient balance immediately updated during posting
- General-purpose patient recall capability
- Automatic posting of all A/R activity to G/L
- Receivables automatically aged
- Simple posting process using charge ticket as input document
- Posting of individual services or range of services
- Collection of extra information needed for insurance claims involving accidents only when required
- Sources of patient referrals recorded
- Each account balance broken down by specific payment sources
- Supports any Dx, Tx coding system
- Default charges, scaled by physician or patient (sliding fee)

ACCOUNTS RECEIVABLE (CONTINUED)

Statements

- Balance-forward billing
- User specifies an individual account or range of accounts
- Reprint capability
- Breakdown of balance into current, 30, 60, 90 day portions
- Delinquency messages
- Patient-specific messages
- Mass message
- User can suppress delinquency message if desired
- User specifies whether to include detailed list of adjustments on bill
- Indication to patient of which services have been submitted to third parties
- Pre-packaged mailer including pre-addressed return envelope
- Supports demand billing

ACCOUNTS RECEIVABLE (CONTINUED)

Third-Party Billing

- User specifies format of each claim form--system handles virtually all forms
- Multiple service codes allowed
- Signature-on-file capability
- Reprint capability
- Prints individual services or start and end date for a range involving multiple occurrences of same service
- Prints up to 2 diagnoses for each service
- Prints one claim form per encounter
- Capable of submitting fee-for-service claims, or claims involving reimbursement of a fixed amount per encounter
- Generation of claims for secondary insurance carriers
- Flags Medicare deductible

REPORTS

Financial/Utilization

- Aged Receivables
- Delinquency
- Credit Balance
- Daily Log
- Productivity
- Collections (by Payment Source)
- G/L Reports (Balance Sheet, Income Statements, etc.)
- Cash Journal

Other

- Patient Recall
- Cross-reference List
- Labels
- Account/Patient Ledger Reports
- Disease Registries
- Deposit Tickets
- Inactive Patients
- BCRR

Clinically-Related Information

- Automatic Recall Reports/Letters
  - Immunization
  - Pap/Pelvic Examinations
  - Chronic Disease Registries
  - Recall NOS

- Disease Registries
  - Chronic
  - Other

- Patient Demographics
  - Age
  - Sex
  - Residence

EXHIBIT 11

SUMMARY OF AREAS OF REQUEST
FOR
MANAGEMENT CONSULTING

- Appointment Scheduling
- Collection Procedures
- Advantages/Disadvantages of a "Partnership" versus a "Professional Corporation"
- Setting up a Professional Corporation
- Feasibility of setting up X-ray facility
- Productivity analysis of Physician Assistant
- Analysis of monthly operating results
- Development of operating budget

EXHIBIT 12

COOP DIRECTORY

Name of Organization: ________________________________

Address: ________________________________

Telephone: ________________________________

Hours: ____________________________ Datemedic ☐
(Office Hours)

SERVICES AVAILABLE

- __ Internal Medicine
- __ Pediatrics
- __ Family Practice
- __ Obstetrics
- __ Mental Health
- __ Nutrition
- __ Other: ____________

PRACTICE TYPE

- __ Solo
- __ Group
- __ Private
- __ NHSC
- __ Residency Program
- __ VA

LEGAL STATUS

- __ Professional Association
- __ Business Corporation
- __ Government Subsidized (eg. VA, NHSC)
- __ Partnership
- __ Private Unincorporated

Teaching Affiliations:

____

____

Hospital Affiliations:

____

____

Insurance:

☐ Participate BC/BS (private ins.) ☐ Assignment Medicare

☐ Assignment Medicaid

List Practitioners (MD, PA, NP) and field of practice on first lines. List support personnel (nursing and administrative) respectively on last lines. Additional names and comments on reverse side.

NAME	DEGREE	FIELD

NAME	DEGREE	FIELD

Additional Comments:

EXHIBIT 13

COOP MANAGEMENT AUDIT

FINANCIAL INDICATORS

(Period ______ to ______)

1. TOTAL VISIT FOR PERIOD ______________
   ON-SITE ______________
   OFF-SITE ______________

2. TOTAL BILLED CHARGES ______________
   ON-SITE ______________
   OFF-SITE ______________

3. REVENUE ______________

4. COLLECTION RATIO* CR1 ______________
   CR2 ______________

5. OUTSTANDING REC. RATIO** ______________

6. CHANGE IN AGED A/R

	30	60	90+ days
THIS PERIOD			
LAST PERIOD			

7. AVG. CHARGE/VISIT ______________ AVG. COST/VISIT ______________
   FIXED COST/VISIT ______________
   VARIABLE COST/VISIT ______________

8. % PAYMENT AT TIME OF VISIT ______________

EXHIBIT 14

COOP MANAGEMENT AUDIT

PRACTICE GOALS

1. WHAT IS YOUR ANNUAL INCOME GOAL?

Actual income last year ____________________

Goal for this year ____________________

Goal for next year ____________________

2. WHAT IS YOUR WORKING HOURS GOAL?

	# Hrs/Day	# Days/Wk	Days of CME	Vacation Days
Last year	__________	__________	____________	_____________
This year	__________	__________	____________	_____________
Next year	__________	__________	____________	_____________

3. WHAT TYPE OF PRACTICE DO YOU WANT?

_____Very Brisk

_____Efficient But Not Frantic

_____Smooth Flowing

_____Number of patient visits per hour

4. STAFFING PATTERNS AND MANAGEMENT INVOLVEMENT

_____Min Staff

_____Use Of PA's or PRN's

_____Activity Involved In Personnel Matters

_____Delegate responsibility

_____Active Management Role

EXHIBIT 15

MANAGEMENT AUDIT COMPARATIVE REPORT

PRACTICE	WRITTEN GOALS/OBJECT.	FORMAL BUDGET	FINANCIAL REPORT MO.	QTR.	ANN.	NO.
Hillsboro						
Lebanon						
Gorham						
Newport						
Ascutney						
Randolph/Rochester						
Gagne						
A.J. Yuskaitis						
Jaffe						
Catino						
Clark						
Kirk						
Ohler						
Frechette						
Parker						
Rosenberg						
Lacey						
Mishcon						

MANAGEMENT AUDIT COMPARATIVE REPORT

FINANCIAL INDICATORS

PRACTICE	PAT.VIS Capacity*	ACT. VIS AS % of Capacity	$\bar{X}$ Charges Per visit	$\bar{X}$ Cost Per Visit	A/R to BC Ratio	Expenses ÷ Charges	Expenses ÷ Receipts
Hillsboro							
Lebanon							
Gorham							
Newport							
Ascutney							
Randolph/Rochester							
Gagne							
A.J. Yuskaitis							
Jaffe							
Catino							
Clark							
Kirk							
Ohler							
Frechette							
Parker							
Rosenberg							
Lacey							
Mishcon							

* Calculated as 25.5 Weeks (Jan-Jun) X Clinic Hrs/wk X Visits/Hr

MANAGEMENT AUDIT COMPARATIVE REPORT

REVENUE & EXPENSES

PRACTICE	Occupancy	Non-Phy Wages	Medical Supplies	Clerical Supplies	Education	Pract. Promo.	Mal. Ins.	Other
Hillsboro								
Lebanon								
Gorham								
Newport								
Ascutney								
Randolph/Rochester								
Gagne								
A.J. Yuskaitis								
Jaffe								
Catino								
Clark								
Kirk								
Ohler								
Frechette								
Parker								
Rosenberg								
Lacey								
Mishcon								

Categories as a % of Total Expenses

MANAGEMENT AUDIT COMPARATIVE REPORT

PRACTICE STATISTICS

PRACTICE	FTE MD's	FTE HCE's	FTE Staff	Scheduled CL Hrs/Wk	On-Site Vis.		Billed Charges	Receipts	Total Expenses	Accounts Receivable	$\bar{X}$ Mo. Billings
					MD	HCE					
Hillsboro											
Lebanon											
Gorham											
Newport											
Ascutney											
Randolph/Rochester											
Gagne											
A.J. Yuskaitis											
Jaffe											
Catino											
Clark											
Kirk											
Ohler											
Frechette											
Parker											
Rosenberg											
Lacey											
Mishcon											

EXHIBIT 16

THE COOP PROJECT AND QUALITY ASSURANCE:
A VOLUNTARY APPROACH UTILIZING A
MULTI-PURPOSE INFORMATION SYSTEM

AUTHORS: John W. Kirk, M.D., Eugene C. Nelson, DSc, Paula L. Stamps, PhD

PRESENTED AT:

Conference on Health Manpower Regulation and Its Effects on Quality and Issues Relevant to the Maintenance of Competence of Health Professionals.

HELD BY:

Northeast Canadian/American Health Council, Campobello Island, August, 1982.

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THE COOP PROJECT AND QUALITY ASSURANCE: A VOLUNTARY APPROACH UTILIZING A MULTI-PURPOSE INFORMATION SYSTEM

INTRODUCTION

Quality Assurance consists of measurement of the process and outcome of medical practice and of correcting deficiencies when they are identified. Efficient and effective methods of measurement have been difficult to develop, but most authorities would agree that such measures can provide an ideal focus for programs looking to maintain and improve the competence of health professionals. It has been particularly difficult to develop quality assurance programs that are feasible and appropriate to small rural practices. The COOP Project has been working to develop such programs for five years, focusing its efforts around a multi-purpose data system, and including the costs of care and functional health status as necessary parameters in assessing the quality of care.

DESCRIPTION OF PRIMARY CARE COOPERATIVE INFORMATION PROJECT

The Primary Care Cooperative Information Project ("COOP Project") consists of a network of 50 freestanding rural primary care practices working in conjunction with the Department of Community and Family Medicine at Dartmouth Medical School. The goals of the project have been to: (a) establish a professional environment that can help attract, retain and educate primary care physicians in rural areas; (b) improve management efficiency and heighten clinical cost-consciousness in the daily practice of medicine; (c) develop practice-based quality assurance systems; and (d) build improved systems for continuing education based on practices self study and cross practice research.

The COOP Project was started in 1977 with 14 practices in New Hampshire and Vermont. Eleven were private practices and three were community health centers that receive government subsidies. Since that time, the network has grown to include 30 practices in New Hampshire and Vermont, and 20 in Maine. Twenty-four sites are private practices and 26 are community sponsored, federally subsidized health centers. Two additional sites are residency training programs in family medicine and pediatrics. The practices are staffed by 113 physicians and 37 physician's assistants and nurse practitioners. They average 28,000 visits per month.

MEDICAL INFORMATION SYSTEM

Central to each of the goals of the COOP Project is a medical information system that is a permanent feature of each practice in the network. The medical information system is not an add-on data collection effort - it has been constructed as an integral party of each practice's patient encounter, billing, accounts receivable, and general ledger system. The core of the Project is development of a medical information system that is tailored to the requirement of each practice, yet contains a basic data set common to all the participants in the network. The basic data set captured in each practice has been collected since November, 1978, through mailing of encounter forms to Dartmouth where the information is keypunched and put on a main frame computer. The medical information system currently captures compatible patient encounter data on 28,000 visits per month. The average data processing cost per physician per year is approximately $1,440.00. Since July, 1980, with improvements and reduced costs of microcomputer systems, the Project has been attempting to develop a distributed microcomputer network to replace the current batch-and-mail encounter form system. Five of our practices currently have on-site microcomputers, and we hope that in the next several years, the rest of the practices will be similarly equipped.

Source Documents:

The integrated medical information system includes two categories of data: (1) patient encounter data on each visit registered in all locations (office, hospital, nursing home, patient's home) and (2) expense and accounts receivable data.

The first category of information, patient encounter data, is gathered on compatible encounter forms called "Superbills". The Superbill is an encounter form that is also acceptable as a bill by many insurance companies. (In New Hampshire and Vermont these companies include Blue Cross and Blue Shield, Connecticut General, and Medicare when attached to Part I.) In fact, all Superbill design features and modifications have been worked out with Blue Shield staff. A sample Superbill is shown in Figure 1. That data set consists of the following variables: practice identification, clinician identification, date of visit, location of visit, patient identification* new or old patient to practice, patient date of birth, patient sex, patient ZIP code, all diagnoses treated, all procedures performed, charges, disposition, appointment status, expected source of payment, adjustments to charges, payment received, and data for special studies.** While the basic form is identical across the practices, diagnoses and procedures are crash imprinted on an individual practice basis, allowing for some variations by specialty, location, or preference. (Approximately one half of all diagnoses and procedures are standardized.) The Superbills are purchased in bulk by Dartmouth and distributed to the practices at 7 cents per form. Typically, practice clerical staff complete the top portion of the document, the clinician checks the appropriate procedure codes, diagnoses, and disposition at the end of the visit, and clerical staff complete the coding by listing charges and scheduling return visits. The top copy of the Superbill is sent to the patient's insurance company, if assignment is accepted, or it is given to the patient as a statement. The patients may then submit the form copy to their insurance company. The second copy is batched and mailed to Dartmouth on a weekly basis. The third copy can be included in the medical record. Those practices using the microprocessor terminal do not batch and mail copies of the Superbill, but enter Superbill data directly into the microprocessor.

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* For confidentiality purposes and generalizability across practices, the Hogben code has been adopted as the patient identifier (i.e., first four digits of last name, initial of first name, and birth date).

** A small space in the lower left-hand corner of the Superbill is reserved for additional data items desired on a short-term basis for special clinical studies. A stamp is made with the appropriate data elements and imprinted on all Superbills used during the study period. For example, in a recent study on the use of antibiotics, the particular drug used, the length of time prescribed, and the mode of administration were recorded in this space.

Use of the Superbills has both advantages and disadvantages. The principal advantage is that they streamline the billing process for many accounts by reducing duplicate recording of information. It follows that since the Superbill is the basic billing document, the data accuracy and completeness are generally high. Between October and December 1980 the completeness rate for procedures varied from 99 to 100 percent; for patient's birthdate, the completeness rate varied from 97 to 100 percent. The main disadvantage of the Supervill involves accurate coding of diagnoses and procedures. When it functions as the bill given to the patient, there may be inaccurate coding of sensitive diagnoses (e.g., venereal disease, schizophrenia, alcoholism). Because the Superbill is most frequently sent to an insurance company, there may be undercoding of nonreimbursable problems (e.g., marital counseling, family planning) or procedures. Finally, the preprinting of common procedures and diagnoses, while facilitating their recording, may also result in a "forcing" phenomenon in which the closest preprinted diagnosis is selected rather than writing out the true diagnosis. A validity study in five practices comparing the Superbill diagnosis to the medical record diagnosis yielded an average discrepancy rate of 5 percent.

The second category of information, involving practice revenues and expenses, is gathered once per month. Data related to revenues and information on operating expenses are summarized on monthly worksheets that incorporate uniform definitions and categories. This allows collection of comparable information across the practices on the following accounting variables: revenues (gross receipts, refunds, net receipts, and collection ratio) and expenses (personnel, office overhead, supplies, equipment, insurance, and bad debt). The expense categories correspond to those contained in Internal Revenue Service Form 1040, Schedule C. The vast majority of the practices in the COOP Project file Schedule C with their tax returns; thus their accounting system is structured to meet its requirements. Accordingly, using those expense categories minimizes clerical effort for the practices and circumvents definitional problems arising from the adoption of a newly created chart of accounts.

Services To The Practices:

By combining the data that is generated by the medical information system with medical school faculty with the relevant expertise, the COOP Project provides a four-part package of services to the practices: (a) clinical and management feedback reports; (b) practice management consultation; (c) continuing medical education and primary care research opportunity; and (d) quality assurance technical assistance. The first three of these have been described in greater detail in previous reports.[1] The rest of this report will describe some of our work in quality assurance.

QUALITY ASSURANCE STUDIES

Developing a quality assurance system for small rural practices was the major goal which led to the development of the COOP Project. Once the data system itself was developed, a consultant in quality assurance began working with each practice to develop ongoing systems for medical care assessment. The specialist helped each site set quality assurance goals that reflected the principles of that practice, and then assisted with planning and executing the assessment, evaluating the results, and repeating the cycle. The emphasis has been on using quality assurance as an educational medium for practice self analysis, and on the development of practical assessment protocols that small practices would be able and willing to institute on a long term basis. The following examples describe some of our efforts to define and improve quality of care.

1. Intra-Practice Audits:

One intra-practice quality audit assessed the practices' success in accomplishing the stated goal that "every patient should have, or be encouraged to have, screening procedure or preventive instruction in areas where these have been demonstrated to be effective". To measure the extent to which practice principles were achieved, performance on three indicator conditions was analyzed: (a) seat belt use in children age 0-4 years; (b) pap smears in women age 18-40; and (c) hemoccult testing in men and women age 50-75 years. The COOP Project data base was used to identify at random 20 patients in each category meeting entrance criteria, and a research assistant was assigned to review the medical records. The findings indicated that the practice's degree of success was 36% for seatbelt instruction, 45% for hemoccult testing, and 86% on pap smear screening. The practices attribute the good results for pap smears to a recall system that has been in use for several years, and has decided that similar office systems are needed to improve performance in the other areas. The practice has instituted new office reminder systems and plans to repeat the quality audit in the future to assess progress.

Many other individual practice audits were done with the help of our Quality Assurance staff. Although these audits were helpful to the individual practices involved, we found that this aspect of our Quality Assurance Program was very labor intensive and expensive, had limited application across the COOP network, and utilized the data system in only a very limited fashion (i.e., to identify records). We have only limited resources for the future to assist the practices with such audits, but most of them now understand the process and continue to do such studies on their own.

2. Cross-Practice Audit:

The COOP Project initiated a cross-practice quality audit assessing the use of antibiotics in ambulatory practice. The objectives of this study were to document the extent of antibiotic utilization, analyze the pattern of variation in antibiotic use, to create any needed medical education efforts related to the results of the study, and to look at the application of the data system to a cross-practice study. Basic encounter data was collected as usual from fourteen practices through the Superbill over a two-month period of time with specific antibiotic information entered in a designated area of the Superbill. Data was analyzed on 12,600 office visits, with antibiotics being prescribed in 10% of these encounters. Extensive descriptive information relating antibiotic use to diagnosis and patient profile was generated, and an educational seminar for COOP members subsequently focused on areas of variation in prescribing practices (e.g., bronchitis, impetigo, UTI).

In addition to the above descriptive and educational aspects of the study, we focused on several areas of antibiotic use in which primary care practitioners have often been criticized: the use of tetracycline in children under 8, the outpatient use of chloramphenicol, and the use of expensive, new broad spectrum antibiotics (cephalosporins, and sulfa-trimethoprim combinations). We did not set out to establish specific detailed guidelines and standards for antibiotic use in these areas, but sought to explain the reasons behind the apparent exceptions from usually accepted standards of care. A detailed report of this study has appeared elsewhere;[2] but in summary, in the 1200 antibiotic related encounters described in the study, chloramphenicol was used twice, tetracycline once in a child under 8, sulf-trimethoprim combinations used 37 times, and cephalosporins 17 times. Through such a process of detailed chart review by a research assistant, followed by interviews with the physicians involved, we discovered that nearly all of these apparent exceptions were adequately justified by the specific details of the clinical cases (e.g., drug intolerance, patient preference, antibiotic sensitivity patterns, availability of samples, etc.) Some of the variations were also due to errors in coding which occurred despite elaborate efforts in the study preparation to avoid such mistakes.

We concluded that the decision-making process for drug prescribing (as well as in other clinical areas) is complex and individualistic, and therefore needs detailed case analysis that is not entirely possible with an automated data system.

3. Clinical Cost-Effectiveness As A Measure Of Quality Of Care:

The members of the COOP Project accept cost of care as an important parameter to be considered in a Quality Assurance Program. Two approaches to cost-containment are to: (a) improve practice management efficiency; and (b) increase cost-consciousness of physicians. The hypotheses on which these approaches are based are that: (a) physician charges tend to increase directly as the costs of producing services increase; and (b) participation in cost-effectiveness studies and the data that shows the physician his impact on medical care charges will be associated with more cost-conscious clinical decision making.

With the aid of our data system, we have provided COOP physicians with detailed analyses comparing across all COOP practices, practice overhead (per provider and per unit of services provided) and practice charges. These figures, along with professional practice management consultation, led to substantial alterations in many of our practices' operating expenses, though a formal follow-up study has not been reported.

Regarding the second hypothesis, we have completed a pilot study of hypertensive patients in three practices, assessing blood pressure control and total costs per patient per year. Case variation was controlled as well as possible. Our findings show that the costs per patient per year ranged from $106.00 in the lowest practice to $158.00 in the highest practice. The variation appeared to be due mainly to differences in medications used rather than visit frequency, office fees, or lab use. Though preliminary, such data provided an ideal focus for discussion and further study of the most economical approaches to quality clinical care (e.g., how can you justify a 50% greater cost per year for the care of your hypertensive patients, in the absence of any indicator that your patients were better off for this more expensive care?).

4. Functional Health Status As A Measure of Quality of Care:

The need for new measures of functional health status has been widely recognized, both to better assess the impact of medical care on health and to better understand the impact of illness on the lives of individuals). The COOP Project has been working with indicators of functional health status in an attempt to develop new and more appropriate parameters for quality assessment.

We have recently completed a study (to be reported in detail elsewhere) measuring the functional health status of adult patients making office visits to COOP practices. Limitations in physical and mental function were assessed independently in 28 practices by both patients (N = 1227) and physicians using a simple global index of disability. Results indicate significant differences between physician's and patient's assessment of function. Functional limitations were associated with increased utilization of ambulatory care, older age, lower education, unemployment and a primary diagnosis of chronic condition. We concluded that functional status could be easily and routinely recorded in medical practice in order to help describe severity, predict utilization, and improve the physician-patient relationship.

CONCLUSION

The COOP Project has combined a well motivated group of widely scattered primary care practitioners with the expertise and interest of medical center faculty into a systematic program trying to improve the quality of rural medical care, increase the professional satisfaction of rural physicians, provide badly needed practice management assistance, and generate primary care research. Each of these objectives relies on information generated by our multi-purpose primary care data system. The project has attained significant success in all of these areas. The integration of an efficient and economical quality assurance system into the COOP Project, however, remains a significant challenge. The challenge is to obtain sufficient clinical detail from the clinical record to identify critical diagnostic and therapeutic decisions. This is a tedious task that cannot be readily done by automated systems or research assistants using necessarily simplified decision rules and standards. Systems such as ours, by helping identify and retrieve charts by age group, diagnosis, or certain other such variables, can facilitate the quality assurance process in the simpler "office system" areas such as immunization rates, date of last follow-up, etc. - but we need to learn much more about how to efficiently identify those critical steps in the medical care process that can allow us to distinguish satisfactory from unsatisfactory medical care in more complex clinical areas. As we ourselves, or others, develop better approaches to this problem, our information network will stand ready to incorporate these approaches into our program of quality assurance approaches.

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EXHIBIT 17

Use of Antibiotics in Primary Care

The COOP Project's Study of Rural Physicians

Paula Stamps, PhD
Jack Kirk, MD
Donald Catino, MD
Donald Clark, MD
Eugene C. Nelson, DSc
A.J. Yuskaitis, MD
Jeanne Arnold, MD

> *"Unfortunately, except for a few studies, little attention has been directed toward antibiotic utilization in primary care and even less toward antibiotic prescribing patterns of rural physicians."*

At least two-thirds of all ambulatory visits to physicians result in a prescription of medication.[1] Estimates suggest that between 15% and 40% of the drugs prescribed in a primary care practice are antibiotics, and evidence indicates that this percentage is increasing.[2,3] Although many studies of antibiotic utilization are hospital-based, a greater proportion of antibiotics are prescribed in ambulatory care settings. Unfortunately, except for a few studies, little attention has been directed toward antibiotic utilization in primary care and even less toward antibiotic prescribing patterns of rural physicians.

Primary care studies that do exist are generally based on the assumption that antibiotics are misused by primary care physicians or that an investigation itself can document the amount of "irrational" prescribing.[4] For example, some studies have focused on the misuse of specific antibiotics such as tetracycline and chloramphenicol.[1,3,5] These studies, however, rely only on data sources such as Medicare claim forms, with no analysis of patient records to document antibiotic use or misuse.

This report presents the findings from a study conducted to describe the antibiotic utilization patterns of a select group of rural primary care physicians who voluntarily share a multipurpose medical information system. The initial goal of the study was to describe physicians' antibiotic utilization patterns based on data collected by a shared information system and to identify areas of inappropriate utilization for targeted continuing medical education programs. The study was also conducted to demonstrate the usefulness of a shared data information system that can be used for managerial decisions as well as for collection of clinical information. The study findings suggest, however, that complete reliance on a data information system for clinical studies is not advisable, even when working with cooperative physicians.

The Primary Care Cooperative Information Project

The Primary Care Cooperative Information Project (COOP Project) is based at Dartmouth Medical School in Hanover, New Hampshire, and enables the collection of information across multiple rural practices. In existence for the past three years, the demonstration project was under-

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Paula Stamps, PhD, *is Associate Professor, Department of Community and Family Medicine (DCFM), Dartmouth Medical School, Hanover, New Hampshire, and Quality Assurance Coordinator of the COOP Project;* **Jack Kirk, MD,** *is Assistant Professor, DCFM, and Medical Director of the COOP Project;* **Donald Catino, MD, Donald Clark, MD,** *and* **A. J. Yuskaitis, MD,** *are Adjunct Assistant Professors, DCFM;* **Eugene C. Nelson, DSc,** *is Assistant Professor, DCFM, and Project Director of the COOP Project; and* **Jeanne Arnold, MD,** *is Associate Chairman for Family Medicine, DCFM. The authors gratefully acknowledge the other COOP physicians who participated in the study: B. Conger, C. Cooley, L. DiNicola, N. Egan, M. Fowler, D. Gephart, W. Gessner, P. Jeffries, E. Jewett, M. Jewett, S. Jordan, E. Kaplan, R. Kiefaber, D. Lacey, M. Lannon, G. MacDonald, J. McDowell, J. Ohler, T. Parrott, C. Perkins, E. Peske, W. Toms, and G. Wilcox. Reprint requests should be directed to Dr. Nelson, Department of Community and Family Medicine, Dartmouth College, Hanover. 03755.*

This research was supported in part by the Department of Community and Family Medicine at Dartmouth Medical School, participating practices in the COOP Project, the Primary Care Research and Demonstration Project, grant number 01-D-000214001-1, the Health Care Financing Administration, grant number 18-97538/1-01, and the W. K. Kellogg Foundation.

Table 1. Most Common Antibiotics Prescribed by COOP Physicians Based on Common Encounter Form Data

Diagnosis	Number of Cases	Drug Most Commonly Prescribed	Second Choice
Otitis media			
< 6 years	247	Ampicillin (80%)	Penicillin (7%)
≥ 6 years	285	Penicillin (53%)	Ampicillin (28%)
Bronchitis	189	Ampicillin (37%)	Tetracycline (27%)
URI	136		
URI, unspecified		Penicillin (73%)	Erythromycin (9%)
Strep infection		Penicillin (90%)	Erythromycin (4%)
Tonsillitis		Penicillin (81%)	Erythromycin (15%)
Pharyngitis		Penicillin (78%)	Erythromycin (6%)
Dermatologic problems	130		
Abscesses		Penicillin (32%)	Erythromycin (22%)
Impetigo		Penicillin (50%)	Erythromycin (33%)
Dermatitis		Penicillin (24%)	Topical erythromycin (24%)
Acne		Tetracycline (63%)	Erythromycin (25%)
UTI—cystitis	86	Sulfa (50%)	Bactrim/Septra (50%)
Sinusitis	58		
Acute		Ampicillin (46%)	Erythromycin (21%)
Chronic		Erythromycin (42%)	Penicillin (21%)
Pneumonia	53	Erythromycin (57%)	Penicillin (21%)
Pelvic inflammatory disease	21	Ampicillin (67%)	Tetracycline (24%)

taken to develop a voluntary model for building clinical research, quality assessment, cost savings, and continuing medical education programs into the daily work of community-based primary care practices.[6]

At the time of the study in 1979, the COOP Project consisted of 16 primary care practices located in New Hampshire and Vermont. The practices include private solo and group practices as well as some practices sponsored by federal programs such as the Primary Care Research and Demonstration Project, National Health Services Corp, and Rural Health Initiatives. Two of the sites also serve as family and pediatric residency programs.

The COOP Project's major focus has been the development of a common information system to compile monthly frequency distributions of patients' age and sex, and quarterly frequency distributions of the various diagnoses for each practice; to produce profiles on clinical and demographic characteristics of patients; and to generate management data on utilization, costs, and productivity. The shared information system is based on data collected from a common patient encounter/billing form that is used by the project's practices.[6]

As might be expected, physicians affiliated with the COOP Project differ from other physicians who practice in New Hampshire and Vermont. For example, member physicians are generally younger and have been in active practice for less time than other physicians in the two states. On the other hand, 86% of the COOP physicians are board certified in their specialty compared with 65% of other physicians in the two states.

Family practitioners and internists are overrepresented and pediatricians are underrepresented in COOP practices: family practitioners comprise 48% of COOP physicians compared with 34% in the two states; internists comprise 39% of the group compared with 33% in the two states; and pediatricians comprise 13% compared with 18% in the two states. Following national trends, many New Hampshire and Vermont physicians choose to practice in urban areas; however, COOP physicians practice primarily in rural areas.

Of the 14 practices that agreed to participate in the study, 8 are solo practices, 1 has two physicians, 4 have three physicians, and the largest group has four physicians. The total number of active patients in the practices ranges from 782 to 7,263. Half of the physicians hold adjunct academic appointments in the Department of Community and Family Medicine at Dartmouth Medical School.

Study Design

As interest in the use of antibiotics developed within the COOP Project, a subcommittee (composed of the authors) was formed in 1979 to design and conduct a study of physicians' antibiotic prescribing patterns, using the shared information system to collect and generate the data. A protocol booklet was developed to detail the data collection process and criteria for noting the use of antibiotics for participating physicians. COOP Project staff then visited the 14 practices to review the study's purpose and protocol. Clinicians and all relevant office staff also were included in these sessions.

The data collection instrument used in the study was a compatible patient encounter/billing form routinely used by the practices. Added to the standardized form were four special study variables that were rubber-stamped onto each form:

- Use of antibiotics—indicated whether an antibiotic was prescribed during the visit;
- Name—indicated the specific drug name and/or the antibiotic category;
- Route—indicated route of drug administration (eg, parenteral, oral, or topical); and
- Duration—indicated the number of days the antibiotic was to be administered.

Patient data were analyzed by illness episode, which was defined as an index visit plus any subsequent visits for the same diagnosis within a three-week period. Two visits within three weeks for treatment of different diagnoses were counted as two illness episodes. Additionally, patients with multiple diagnoses were excluded from analysis.

Table 2. Antibiotic Choice by Physician Specialty for Three Conditions

Specialty	Otitis Media	Bronchitis	Cystitis
Family practitioner	Ampicillin	Ampicillin	Bactrim/Septra
Internist	Ampicillin	Tetracycline	Ampicillin
Pediatrician	Ampicillin	Erythromycin	No cases

Categories were used to classify both diagnoses and antibiotics on the encounter form. Diagnostic categories used in the study were only the preprinted diagnoses common to all practices. Providers were asked to avoid the use of upper respiratory tract infection (URI) and urinary tract infection (UTI) as diagnostic categories, as the subcommittee considered them too broad to be meaningful for study purposes.

Common antibiotics were placed into categories by the subcommittee. Each provider coded the category number as well as the actual drug name on the encounter forms. Drugs not easily coded by clinicians were coded by project staff after consultation with the subcommittee.

Study Findings

During the two-month study period in April-May 1980, 12,600 office visits were made to the 14 practices, with antibiotics prescribed in 1,300 encounters. This number amounted to approximately 10% of all visits, ranging from 6% to 18% in the various practices. Time spent in actual data collection varied from 21 to 50 days for different practices, with longer time periods allowed for the smaller practices.

Table 1, page 17, shows the frequency distribution of antibiotic prescriptions, as well as the first and second drug choices, for eight of the most common diagnoses. Three diagnoses—otitis media, bronchitis, and cystitis—were then examined in greater detail because they were common diagnoses, particularly interesting to the physicians, and well-defined by the data system.

The findings listed in Table 2, page 18, suggest that some variations in prescribing patterns did exist among different specialty groups for the three conditions. However, as suggested by Table 1, the similarities in prescribing patterns among different specialties were more notable than the differences.

Accepted patterns of treatment for conditions such as otitis media, bronchitis, or cystitis are not so specific as to routinely exclude most of the variations found for drug choices in this study. For example, range of treatment duration was fairly small in this study. For bronchitis and otitis media, the range of treatment duration was from 5 to 10 days; for cystitis it was 10 to 14 days.

After analyzing the treatment results for the three conditions, the subcommittee was puzzled by the findings, especially for otitis media cases. By the data collected, it appeared that only 35% of the otitis media cases in children older than six and 59% of the cases in children younger than six were being treated with antibiotics. Pediatricians seemed to have the lowest treatment rates and family practitioners the highest rates. This apparent discrepancy led the subcommittee to review the records of patients with otitis media to determine the validity of treatment data collected.

All otitis media cases were reviewed, and physicians and staff involved in the care of these patients were interviewed. It was discovered that despite the detailed instructional booklet and the several meetings with project staff, providers in the various practices were committing coding errors in otitis media cases. For example, a pediatrician would code a new case of otitis media on a follow-up visit as well as on all new visits, but only note the prescription of an antibiotic for new cases. Thus, treated cases appeared to be undercounted. After the patient records were reviewed, however, treatment rates for otitis media in patients younger and older than six were 78% and 67%, respectively.

Misutilization of Antibiotics

After conducting a record review to validate the data, the subcommittee then decided to look more closely at the physicians' prescribing patterns for four commonly used antibiotics —chloramphenicol, tetracycline, cephalosporin, trimethoprim-sulfamethoxazole—that are commonly referred to in the medical literature as being misused. The subcommittee decided to conduct a review of patient records to determine the use of these drugs and to interview physicians to ascertain the factors that led them to prescribe a specific antibiotic.

The four drugs were selected for review for several reasons. For example, the use of chloramphenicol or tetracycline could be associated with side effects that could otherwise be avoided by prescribing an alternate medication. Furthermore, the other two drug types involve relatively higher costs to patients than other antibiotics, and also contradict agreement by the subcommittee that they are not the best drugs to use in ambulatory care.

No explicit criteria for appropriate use were developed for these drugs except for the relative contraindications based on drug safety, cost, or type of patient population. Table 3, page 20, lists the drugs, the number of prescriptions, and the major sources of risk as defined by the subcommittee when using these drugs.

Chloramphenicol. Record review indicated that chloramphenicol was used in two cases. In one case, the drug was used to treat a persistent lower respiratory tract infection in a severely ill elderly patient who also had chronic obstructive pulmonary disease. The patient died six months later from respiratory failure. The record review suggested that a sputum culture was not obtained at the time the drug was prescribed, but a series of antibiotics had been tried previously without success. In the other case, the drug was administered in the hospital to a 55-year-old patient with a multiple drug-resistant *Hemophilus influenzae* infection of the lower respiratory tract. The patient was later seen at one of the COOP practices.

Tetracycline. This drug was prescribed for a child younger than eight years old who suffered from myringitis. The patient record revealed that the patient was allergic to penicillin. Moreover, when the patient's physician was interviewed, he said that the use of tetracycline would not be a course of action he would repeat because of the drug's known side effects in very young pediatric patients.

Cephalosporin. Of the 21 instances of cephalosporin usage reported by the data system, 17 cases were validated by record review and 4 cases were determined to be coding errors. Diagnoses for the 17 cases included cellulitis or abscesses (8), bronchitis (5), and otitis media (4). Record review revealed that most of the 17 prescriptions were written by family practitioners and internists. None of the 17 records indicated that physicians had discussed costs of the drug with patients, although one record did note that the patient was given a free sample. Culture and sensitivity tests were done in only 2 cases; other antibiotics were tried first and failed in 3 cases; and in 5 other cases, allergies to other antibiotics were noted in the record.

Trimethoprim-sulfamethoxazole (Bactrim/Septra). Of the 37 instances of Bactrim/Septra prescriptions initially entered into the data system, all were validated by record review. Most of the prescriptions were written by family practitioners. The most frequent diagnosis was UTI (21) followed by otitis media (9). Approximately 10% of the patients with otitis media seen by family practitioners were given a prescription for Bactrim or Septra. Forty-five percent and 55% with UTI received Bactrim or Septra from their family practitioner or internist, respectively.

Record review revealed an explanation in all of the records for selection of Bactrim or Septra as the drug of choice. In 17 cases, Bactrim or Septra was the second or third medication tried. Allergies accounted for Bactrim or Septra prescriptions in 4 cases and the remaining 16 cases had a variety of reasons for the prescriptions, including convenience of dosage, physician

Table 3. Usage and Risk for Four Selected Antibiotics

Drug Name	Patients "At Risk"	Major Source of Risk or Utilization Problem	Actual Number of Instances	Number of Different Providers
Chloramphenicol	All ages	Aplastic anemia	2	2
Tetracycline	Children under eight years old	Mottling of teeth	1	1
Cephalosporin	All ages	Expense and potential loss of effectiveness	17	13
Trimethoprim-sulfamethoxazole	All ages	Expense and potential loss of effectiveness	37	12

doubts about patient compliance, and recurring conditions.

Comments

As with many quality assurance (QA) studies, the findings from this utilization study differed slightly from what the researchers had anticipated when they set study objectives. The study's objectives were to describe antibiotic utilization patterns in a group of rural primary care physicians and to determine areas of improper or inappropriate utilization in order to target special educational sessions to member physicians.

The researchers believe they met the study's first objective. A description of antibiotic prescribing patterns was provided, and all clinicians received information concerning not only their own prescribing patterns, but also those of all other group members. In addition, because of the obvious variability in drug choice for treatment of bronchitis and impetigo (see Table 1) among member physicians, an education session was held at the physicians' quarterly meeting that focused on the wide variability of acceptable treatment and the cost of various drugs.

Achievement of the second objective, however, was not possible within the original framework of the study. To determine inappropriate utilization of antibiotics, the researchers believed that another type of data collection was required. Analysis of the descriptive data collected by the information system prompted several questions concerning the reasons for low treatment rates for otitis media and the apparently high antibiotic treatment rate for URI. The subcommittee recognized that the apparently high antibiotic treatment rate was caused by too many specific diseases being included under URI (see Table 1). It became obvious to the researchers, however, that it would be impossible to determine inappropriate utilization without modifying data collection methods to include actual examination of patient records.

After a lengthy process of reviewing patient records and interviewing physicians, researchers uncovered a number of problems relevant to the coding of diagnoses on the encounter forms—the most common involving coding procedures for follow-up visits. In a study that involved a sophisticated data system, a special instructional booklet, personal visits from COOP staff, and a group of cooperative, motivated physicians, individual record reviews were still needed to clarify the many equivocal utilization patterns that were uncovered through the use of a standardized encounter form.

When the specific record reviews were conducted, the researchers concluded that very little misutilization actually occurred within this group of clinicians. The record reviews provided suitable explanations for almost all antibiotic utilization. Contrary to many prior reports, not all physicians overutilize antibiotics. On the whole, COOP physicians seem to use antibiotics conservatively and do not make major, easily identifiable mistakes in their use of antibiotics for treating ambulatory patients.

The researchers recognize, however, that the physicians involved in the COOP Project are unique. They include physicians who, for the most part, are satisfied with their work and who are generally committed to rural practice. Further, most of the physicians serve as preceptors for medical students and half of them have academic appointments at Dartmouth Medical School. Thus, they seem willing to cooperate in a voluntary project that results in an information system that shares both managerial and clinical data among the practices.

Before the findings discussed in

this report are dismissed as a combination of methodologic limitations and the unique characteristics of the project's physicians, it might be helpful to review the literature that might be compared to this study's findings.

Literature review. Most of the antibiotic utilization studies conducted in primary care rely totally on self-reported encounter forms or Medicaid forms.[1,3,5] The researchers' experience in the present study, however, indicates that reliance on these types of data sources does not adequately address the complicated problem of antibiotic usage in ambulatory care. The researchers found diagnostic accuracy and antibiotic identification very difficult to control by using only an automated data information system; individual record reviews were necessary to investigate underlying variations. Conclusions based on encounter or Medicaid forms may be sufficient to identify clinicians who are practicing medicine with marginal acceptability, but they are of little use in identifying the more subtle questions of appropriate utilization among the majority of physicians.

Variation in prescribing patterns is a subject that can be repeatedly documented; however, this variation may be no greater in prescribing patterns than in any other aspect of medicine. Prescribing drugs is simply an extension of diagnostic and treatment processes. Although investigators should still attempt to define appropriate medical behavior, they must be wary of the data collection methods used to measure such behavior. Optimal use of antibiotics depends on subtle and complex considerations of efficacy, safety, acceptability, and cost in each specific clinical situation. To attempt to retrospectively assess physician performance in an area such as drug selection requires a specific review of well-kept patient records.

Two separate problems are identified in this study. The first problem is the inaccuracy of any data system —a flaw that the researchers in this study were able to correct. However, the other problem is the need to go beyond descriptions of utilization patterns to a meaningful analysis of variations. Data systems that rely on accurate encounter forms can identify gross variations in a heterogeneous population of physicians. In a homogeneous group, such as the one used in this study, however, this type of encounter-based system only scratches the surface of the issue—providing little more than a specific direction for further in-depth analyses.

Need for further investigations. Schaffner et al note:

> . . . effective intervention programs cannot be designed from the "armchair": we must learn *who* is prescribing *what* drugs to *whom* for *which* diagnoses. Then, based on documented patterns of practice, we can design and target programs of re-education.[5]

The researchers' only disagreement with this observation is undoubtedly the definition of the armchair. A surveillance system based on encounter-form data, even with the unique advantages of COOP's voluntary system coupled with personal instructions and interviews, produced little more than an *index* for subsequent case review. The researchers believe that it is critical to go beyond grouped data to the data sources within the patient record for further analyses.

An encounter-form surveillance system can be helpful with some aspects of QA studies, the most obvious being the identification of possible problem areas for more in-depth analysis. However, in a group of homogeneous physicians who appear to practice medicine within the scope of generally acceptable standards, it is important to examine the more subtle variations that may differentiate good medical practice from exceptionally good medical practice.

Automated data systems will continue to be useful for indexing patient characteristics and diagnoses, preliminary monitoring, utilization reviews, and cost-related studies. For more detailed analyses, however, more information is needed to help physicians identify and correct clinical shortcomings.

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EXHIBIT 18 7/82

FUNCTIONAL HEALTH STATUS LEVELS OF PRIMARY CARE PATIENTS:

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FUNCTIONAL HEALTH STATUS LEVELS OF PRIMARY CARE PATIENTS:

ABSTRACT

A cross-sectional study was conducted to measure the functional status of adult patients making office visits to primary care practices. Limitations in physical and mental function were assessed independently in 28 practices by both patients (N=1227) and physicians (N=47) using a simple global index of disability. Results indicated that 12% of patients rated their physical limitations as major and 8% rated major emotional limitations during the past month. The comparable assessments by physicians were 5% and 4% respectively; these differences in assessments between patients and physician were very significant ($p < .001$).

Patient functional limitations were associated with increased utilization of ambulatory care, older age, lower education, unemployment, and a primary diagnosis of a chronic condition.

We conclude functional status can be easily and routinely recorded in medical practice to help describe severity, predict utilization, and improve the physician-patient relationship.

INTRODUCTION

The need for new measures of functional health status* to complement such traditional indicators as age-adjusted morbidity and mortality rates, has been widely recognized,[3,4] and there are two major reasons for this need. The first is to assess the impact of medical care on health, thereby improving treatment and resource allocation decisions. McDermott stated that the goal of today's health system is to prolong "effective life by preserving or restoring function in an individual".[5] There is, consequently, a strong need for indicators to measure the influence of the personal physician, but no such established measures exist. The second is to gain a better understanding as to the ramifications of disease on the individual patient's life -- his work, social activities, and emotional well being -- which could aid in making the physician-patient relationship more successful through improved physician understanding of the patient's perspective of health problems and could impact on the design of treatment regimens.[6] It has been shown, for example, that the physician's and the patient's perspective of the same pathophysiological process can differ markedly. The physician tends to focus on the disease, "an objective phenomenon characterized by altered functioning of the body as a biological organism", while the patient thinks in terms of illness, a subjective phenomenon in which individuals perceive themselves as not feeling as well and therefore may tend to modify their normal behavior."[7]

Functional health status has been assessed with many different tools,[8-12] but few have been used to gauge the impact of medical care on patient function.[13-16] The results from the research that has been done indicate that medical care tends to have slight impact on functional status. Some studies have analyzed the degree of agreement on functional health status between clinicians and patients.[17-22] Their purpose was to validate new (patient-reported) functional status measures against clinical raters' assessments of functioning under ideal conditions. These validation studies suggest that patient reported functioning is significantly associated with clinical raters' assessments, but that the correlations are stronger among observable physical activities (e.g., walking) than self-help tasks (e.g., cooking, shopping) or mental and social functioning.

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* The term "functional status" refers to the actual performance (or capacity to perform) of a wide range of physical (running, walking, lifting), social (sports, hobbies, clubs), and work activities (job, housework, school work) that are normal for people in good health. The term "disability" is closely associated with the concept of functional status. It is defined as "the consequence of the effects of ill-health on activities essential to daily living".[1,2]

This paper describes the functional health status of primary care patients at time of visit and the degree of physician-patient agreement on ratings of function. A simple global patient self-assessment scale was found to correspond well with more elaborate functional status scales. Patients' self-reported health status was positively related to simultaneous ratings by physicians and the outpatient charges for medical care for the patient during the previous year. These results suggest that patient functional status level will be associated with the patient's use of ambulatory medical care.

METHODS

A cross-sectional, observational research design was used to gather data on the functional status of adult patients (N=1227) visiting 28 primary care practices. Health status ratings were made independently by the patient and the physician. The research setting, study questions and operational definitions, research design and data collection procedures, and sample size and data analysis are described below.

Research Setting: The research was conducted in the summer of 1981 in practices that are members of the Primary Care Cooperative Information Project.[23,24] The COOP Project is a voluntary organization that includes 50 medical practices in Maine, New Hampshire, and Vermont that serve over 100,000 patients per year. Forty-eight of the 50 practices are small, primary care settings (i.e., five or fewer physicians), about half are private, fee-for-service organizations, and the remainder are government subsidized, rural health centers.

Practices in the COOP Project are linked together by a medical information system that collects and feeds back compatible data on patient encounters, practice revenues and expenses. The organization carries out activities in four functional areas: (1) research, (2) education, (3) quality assurance and (4) practice management. Membership in the COOP includes specific benefits and responsibilities that are coordinated by staff based at Dartmouth Medical School.

Sample Size: Twenty-eight of the 50 practices eligible to take part in the study elected to do so. Most of the non-participating practices are located in Maine. The logistical problems associated with visiting each of these practices to orient them to the research protocol as well as their more distant association with the COOP were the prime reasons for failure to take part in this particular study. The 28 participating practices range in size from one to five physicians, are staffed by a total of 47 physicians, and are predominately located in rural communities with populations under 15,000.

Study Questions and Operational Definitions: The study was designed to answer several questions:

1. What is the level of physical and mental function of adult patients making office visits to primary care practices?
2. How much agreement is there on functional ratings between the clinician and the patient?
3. What are the causes of variations in function ratings between physicians and patients?
4. What characteristics are associated with poor functioning?

The operational definitions which were used to gather health status ratings from the clinician's perspective were global questions related to physical and mental functioning. This means that a single question was used to measure the entire construct of physical function and another question was used for mental functioning. The operational definitions used to assess the health status from the patient's vantage point consisted of similar global questions (to answer Question #2), plus several health status indices (with established reliability and validity) to provide more precise measurement of health status.

The following two questions were used to obtain global ratings of physical and mental health status from both the physician and the patient:

1. How would you rate your (patient's) physical functioning during the past month?
2. How would you rate your (patient's) emotional functioning during the past month?

Response categories for each question were:

1. Not limited
2. Small Amount of Limitation
3. Medium Amount of Limitation
4. Large Amount of Limitation
5. Extremely Limited

To supplement the two questions listed above, more detailed measures of physical and mental health status were gathered using health scales developed and validated by the Rand Corporation. (Appendix One shows these scales, their meaning and their respective reliability coefficients.) Demographic information on patients' age, sex, marital status, employment status, and education were collected, as well as clinical data on variables such as reason for visit, diagnosis, and disposition.

Two different approaches were taken to establish the validity of the aforementioned global ratings of functional status. First, the association was measured between the two global questions and the Rand health status scales which have pre-established reliability and validity. The results indicate that both the physicians' and patients' global ratings of physical and emotional functioning had moderate to strong correlations (0.26 to 0.65) with the relevant Rand health status indices. Second, the correlation between the two global functional status measures and two observable indicators of utilization that may be associated with health status were measured. These findings (discussed in next section) demonstrated that ambulatory visits and charges per patient per year both tend to increase directly as ratings of functional limitation increase. These findings provide quantitative support that helps to establish the validity of the global ratings as accurate indicators of health status.

Research Design and Data Collection Procedures: Patient intake occurred at time of visit to the practice. The receptionist in each practice introduced the study briefly to a representative sample (either a consecutive series or systematic sample) of adult patients who were seen in the office. Each practice was asked to enter 40 patients per clinician, age 18 and over, into the study. Data on age and sex of persons visiting these practices were collected routinely. Comparison of the proportion of study patients' age-sex distribution to that for all patients' visits indicated that the sample is representative of the universe of patients using these practices.

Patients completed a self-administered questionnaire that included a consent form, items from the Rand health status scales, the two global health status questions, plus demographic variables. The health questionnaire was pre-tested in three practices and revised twice prior to final implementation. It was professionally printed, used large type-face to minimize vision problems, and took an average of five to ten minutes to complete. More than 90% of adult patients who were asked to participate provided consent and contributed usable questionnaires. Physicians rated the health status of these patients at the end of the visit by coding their assessment of physical and emotional functioning onto an encounter form that COOP practices use routinely for all patient visits.

Before starting the study, the entire staff in each practice was oriented to the study procedures. This was done by a research coordinator who made a special visit to each practice to deliver a slide-tape presentation on the study and to answer logistical or methodological questions. Shortly after a practice began entering patients, the research coordinator telephoned the practice to identify and correct any difficulties that the practice was experiencing in carrying out the research.

Data Analysis: Frequency distributions were used to determine health status levels, and cross-tabulations were produced to measure agreement in ratings between physicians and patients. The kappa statistic was used to measure the strength of physician-patient agreement. This statistic ranges from -1.0 to +1.0 (perfect disagreement to perfect agreement) and corrects for chance agreement. Multivariate analysis techniques, including multiple regression and formulation of contingency tables with three or more variables, were used to detect possible sources of variation between raters.

RESULTS

Characteristics of Patients: The characteristics of the 1227 patients who were entered into the study are shown in Table 1. One third (33%) of the patients were males with a mean age of 48 years and two-thirds (67%) were females, averaging 40 years of age. One-quarter (25%) were age 18 to 30, while 15% were 70 years or older. Approximately one-quarter (24%) did not have a high school diploma, and 37% had some college education or an advanced degree. Two-thirds (69%) were either employed or homemakers, one-quarter (25%) were retired, and a small percentage (7%) were either unemployed or students.

Health Status of Patients Vs. Community Residents: The results on seven different health status scales were compared in two different populations: (1) The New England sample of 1227 patients visiting primary care practices, and (2) the Rand Corporation's random sample of 1209 community residents in

Dayton, Ohio. All scores were normalized to make a value of 10 represent the best possible score and 0 the worst.

Four scales were used to measure physical health status. The Role Activity scale showed the greatest difference between the two populations with patients' mean score of 7.6 compared to community residents who average 9.4. Further analysis indicates that 18% of the patients scored "very low" (i.e., lowest quarter of possible scores on scale) on the Role Activity index. The Physical Ability scale generated the next largest difference between patients and residents with their respective scores averaging 8.7 and 9.6. Eight percent of the patients' scores were in the lowest quarter. Both populations had average scores near the top on the other two scales -- Self-Care and Mobility.

Three mental health scales were used -- Anxiety, Depression, and Vitality. Community residents had slightly higher average scores than patients on each mental health index. Both groups appear to exhibit a substantial amount of stress, (Anxiety scores average 7.6 and 7.1 among patients and residents). Only 5% of patients, however, scored "very low" on Anxiety or Vitality and 3% on Depression. Overall, these results suggest that patients enjoy almost as good physical and mental health as community residents with the exception of Role Activity performance (i.e., ability to work on job or do housework) where patients have substantially greater levels of dysfunction.

Global Ratings of Physical and Emotional Functioning:

Figure 1 illustrates the physicians' and patients' ratings of physical and emotional functioning during the past month. According to the physicians, more than half of the patients (56%) were free from functional limitation, physically, while self-ratings by the patients indicate that a majority of patients (63%) experienced limitations ranging from small to extreme. Twelve percent of patients' self-ratings versus 5% of physicians' ratings of patients were in the large or extreme categories of limitation. The same pattern of results is observed for emotional health as that which occurred for phsyical functioning. From the patients' vantage point, only 39% were free from emotional problems, 52% claimed moderate limitations, and 8% had major limitations. From the physicians' perspective, almost two-thirds (65%) of the patients had no mental health limitations, 31% were moderately limited, and only 4% had major limitations. The findings in Figure 1 indicate that the patient consistently rates himself more limited than does the physician.

The overall proportions of emotional health status scores are comparable to the physical functioning scores for each group of raters (physician or patient). For example, according to the patient ratings, 52% had limitation levels of "small or medium" on emotional health, while 51% registered that same level in physical functioning. The comparable percentages for physician ratings were 31% and 39%. The only exception to this trend towards consistency in levels of ratings is among patients in the major limitations category. Fifty percent more patients classified themselves "large or extreme limitation" on physical functioning (N=136 or 12% of patients) than on emotional health (N=89 or 8% of patients).

Functional Status and Utilization: Table 2 presents the results on the association between patients' global ratings of physical and emotional function and two objective indicators of medical care utilization: (1) average number of office visits per patient per year; and (2) average amount of office charges per patient per year. The analysis is based on medical care utilization charges from a randomly selected subsample of 200 of the 1227 patients included in the larger study. The findings show a marked trend in the expected direction. Visits and charges per patient increase as patient ratings of functional limitations increase. For example, the no physical limitation group averaged 3.3 visits and $78 in office charges per year compared with the large to extreme limitation group which averaged 7.3 visits and $253 in office charges respectively, ($p<0.001$). Similar findings were observed with respect to emotional functioning. The no limitations group registered 3.1 visits per year and $78 per year while the large to extreme group had comparable figures of 7 visits per year and $185.00 per year ($p<0.001$).

Variations in Ratings: Variations in agreement between physicians and patients are illustrated in Tables 3 and 4 for physical and emotional functioning respectively. Inspection of these tables shows that patients were three times more likely to claim more limitation than the physician would judge. The three "off-diagonal" cells in the upper right hand corner represent cases where the physician rates the patient as more limited than does the patient. The upper right cells account for about 10% of cases compared to 35% of cases in the lower left cells. The result is to produce a statistic of agreement, kappa, that is very significant, but is relatively low $k=0.24$, $p<.001$ physical and $k=0.18$, $p<.001$ emotional). This is explained mostly by the large number of cases (25% physical and 30% emotional) that fall into a particular "near miss" category. This is a situation whereby the physician assesses the patient as being free from limitations while the patient assesses himself as being somewhat (small or medium) limited. If, however, self-assessments by patients of either none, small, and medium limitations in physical and mental functioning are compared to corresponding physicians' assessments, outstanding agreement is reached (96% MD vs 88% and 95% MD vs. 91%).

Multivariate analysis was used to determine if agreement was systematically better for certain types of patients (i.e., defined by age, sex, education employment status, or marital status). The findings were unremarkable with one exception. There was significantly ($p<.001$) better agreement between physicians and patients for young males (kappas for males and females under 30 years were 0.38 and 0.09 respectively) and worse agreement for males of advanced age (kappa for males and females age 70 and older were 0.15 and 0.32 respectively). This was because: (1) young women's self-assessments were described as small while physicians judged no limitations; and (2) men of advanced age rated themselves as being bothered by major limits while their physicians assessed moderate limitations.

The data was also analyzed to determine if some practices tended to have consistantly higher levels of agreement with patient ratings. Across the 28 practices, the range of perfect physician-patient agreement on health status varied from 32% to 71% on physical functioning, and from 27% to 70% on emotional. Thirteen (46%) of the practices had perfect agreement with at least half of their patients on physical functioning and only 8 (29%) had perfect agreement with at least half of their patients on emotional functioning. No physician variables (such as specialty, practice type, or volume) were associated with level of agreement.

Reasons For Physician-Patient Disagreement: An attempt was made to gather more information as to the reasons for major ratings disagreement. A total of 297 cases occurred where there was large disagreement between the patient and clinician on global ratings of either physical or emotional functioning. The clinicians were asked to review the medical records of these patients and try to determine the reason for the disagreement. Responses were received on 60% of the patients. The reasons most frequently given for the disagreement were: (1) clinician error (44%), (2) patient error (38%), (3) insufficient knowledge of patient (12%), and (4) miscellaneous (6%).

Of the cases where the clinicians felt that the patient's rating was incorrect (N=70), the reasons offered were: (1) patient tends to deny disability (28%), (2) patient tends to exaggerate diability (28%), (3) patient had major psychological problems (17%), (4) patient likely misunderstood the question (9%), and (5) other miscellaneous (17%). It does not appear that the discrepancy is related either to who initiated the visit (patients initiated 48% of the visits and the clinicians 52%) or how well the physician knew the patient. When the clinicians were asked to rate how well they felt they knew the patient on a scale of 1-5 (1=not well and 5=very well) the mean rating was 3.3, indicating that the discrepancy probably was not due to lack of knowledge of the patient.

Characteristics of Patients With Low Health Status: When patients who rated themselves as having no limitations in physical functioning were compared to patients rating themselves as having major limitations, it was found that the no limitations groups tended to be younger (average age 41 vs. 70 years), employed (60% vs. 27%), and had attained a higher level of education (12.9 years vs. 11.6 years), (Table 5). No significant differences were found for sex.

The most frequent primary diagnoses of patients with major limitations were chronic conditions such as atheroschlerotic heart disease (11%), diabetes (8%), congestive heart failure (6%), anxiety or depression (5%), chronic obstructive pulmonary disease (5%), and arthritis (5%). This contrasts with the leading primary diagnoses of patients free from limitations who were more likely to have acute problems or health maintenance visits (e.g., pregnancy care and birth control, 7%, medical exam, 6%).

DISCUSSION

Methods: The study aimed to gather accurate data on functional health status in adult primary care patient populations from the patient's and physician's perspective. We succeeded in entering more than a thousand persons into the study who are representative of the adult patients served by participating practices. The analyses done to produce evidence on the validity of the global ratings suggest that they are associated significantly with both prior validated health status indices and with objective variables such as utilization of physicians and medical care expenditures. The findings reported here are likely to be representative of those of primary care practices elsewhere. The Rand scale scores were extremely close to the Dayton, Ohio sample of community residents on all scales except Role Activity.

Level of Health: If one looks at the comparative results showing health status levels for patients and community residents respectively, it might be concluded that the patients are extraordinarily healthy. The difference between patients and residents is substantial in only one area, Role Activity limitation. Inspection of the global ratings results, however, suggests something different. The results indicate that one-half of the patients have had small or medium limitations in function for at least the past month and about one in ten have limitations that are large or extreme. This leads one to conclude that large proportions of primary care patients suffer from health-related problems that undermine their ability to consistently perform to capacity, both physically and mentally, for extended periods of time.

This apparent discrepancy between the results from the two different types of indicators of functioning used in the study (the Rand scales and the global ratings) may possibly be explained by considering the patient's sick role behavior and the rate of illness episodes in populations. Williamson and others have shown that the overwhelming majority of illnesses (about 80%) do not trigger a physician visit.[29] McWhinnie and Parson have suggested that a person is more likely to visit a physician if a disease disrupts daily life by causing pain, worry, work impairment, or other social role limitations.[30,31]

The findings produced in this study are consistent with these observations. That is to say, patients visiting physicians are about as healthy (or sick) as other persons residing in the community, but they are more likely to believe that they have a health problem that is hampering their physical and mental capacity.

Physician-Patient Assessment: The findings suggest that physicians and patients achieve near perfect agreement on functional ratings less than half the time. Surprisingly, perhaps, there was little difference in concordance levels for physical dimensions (which tend to be more observable) versus emotional functioning (which tend to be more difficult to detect). In short, there were a substantial number of instances of disagreement between the physician and patient. This raises the question (easily answered at one level) of what causes the discordance. Many patients rate themselves slightly more limited than their physicians. This tendency towards poorer ratings by patients runs counter to results obtained elsewhere which have indicated that patients generally estimate their health more favorably than do their physicians.[32,33,34] Usually, the absolute magnitude of disagreement was small (e.g., patient would rate limitation "small" while physician would rate "none" or patient would rate limitation "large" while physician would rate it "medium"). This type of minor disagreement accounts for the vast majority of variation. There were, however, 297 (24%) instances of major disagreement (e.g., patient rates limitation "extreme" and physician rates "none" or vice versa). The follow-up results suggest that clinician error and patient error were about equally likely (44% and 38% respectively). Lack of knowledge of the patient was rarely cited by physicians as being the source of variation when major disagreements occurred.

While it is relatively easy to spot instances of discordance and to classify them as being minor or major, it is very difficult to understand the actual meaning that physicians and patients ascribe to the different categories of functioning. What does it mean to a patient when he rates his physical or emotional limitations during the past month as being medium or extreme? What does it mean to the physician when he rates the patient's functional limitations as medium or extreme? Do they mean the same thing to both the physician and patient? The answer to this question cannot be given without doing further studies that simultaneously collect quantitative information like that reported herein plus qualitative, in-depth information from both the physician and the patient to determine what particular events, actions, situations, or signs triggered a particular level of rating. This kind of information will reveal whether the physician and the patient are, in fact, rating the same thing. Perhaps the physicians' ratings of function are filtered through the "disease" model while the patients are screened through the "illness" paradigm. If so, the variation would be explained mostly by the different orientation of physicians and patients.

This leads to a second question. What difference does level of agreement between physician and patient on the impact of disease on functioning make on treatment outcome or the quality of the doctor-patient relationship?

Although this question cannot be answered with available data, it is especially important for primary care physicians to answer if they are to fill the niche in medicine that relates the subjective illness experienced by the patient to the objective therapy that biomedical scientists and sub-specialists have made possible. The uniqueness of the role of the primary care physician stems, in part, from his ability to serve as the mediator between biomedical science and patients. To maximize efficiency, the physician should understand fully the consequences of both therapy and treatment on the life of the patient as well as the course of disease. This will help avoid the paradoxical situation in which the physician rates treatment as a success and the patient considers it a failure since it eroded (or did not restore) function.

CONCLUSION

One aim of this study was to describe the case mix of primary care patients with respect to functional status. The results help to expand our understanding of the types of patients who visit medical practices. Another objective was to inspect variations between functional status ratings from the patient's and physician's perspective. The findings document the frequency and magnitude of variations and begin to provide some insight into the source of discrepancies. Another purpose was to determine to what extent functional limitations were associated with patient demographic characteristics, diagnosis and utilization. The analysis indicated that functional disability is associated with multiple factors.

Attention in medicine is shifting towards measurement of outcomes that show the ripples that disease and its treatment make throughout the patient's life. Perhaps the most significant finding of this study is that physical and mental function can be easily and routinely assessed in primary care practices.

FIGURE 1: PHYSICAL AND EMOTIONAL FUNCTIONING DURING THE PAST MONTH AS RATED BY PHYSICIAN AND PATIENT (N = 1101)

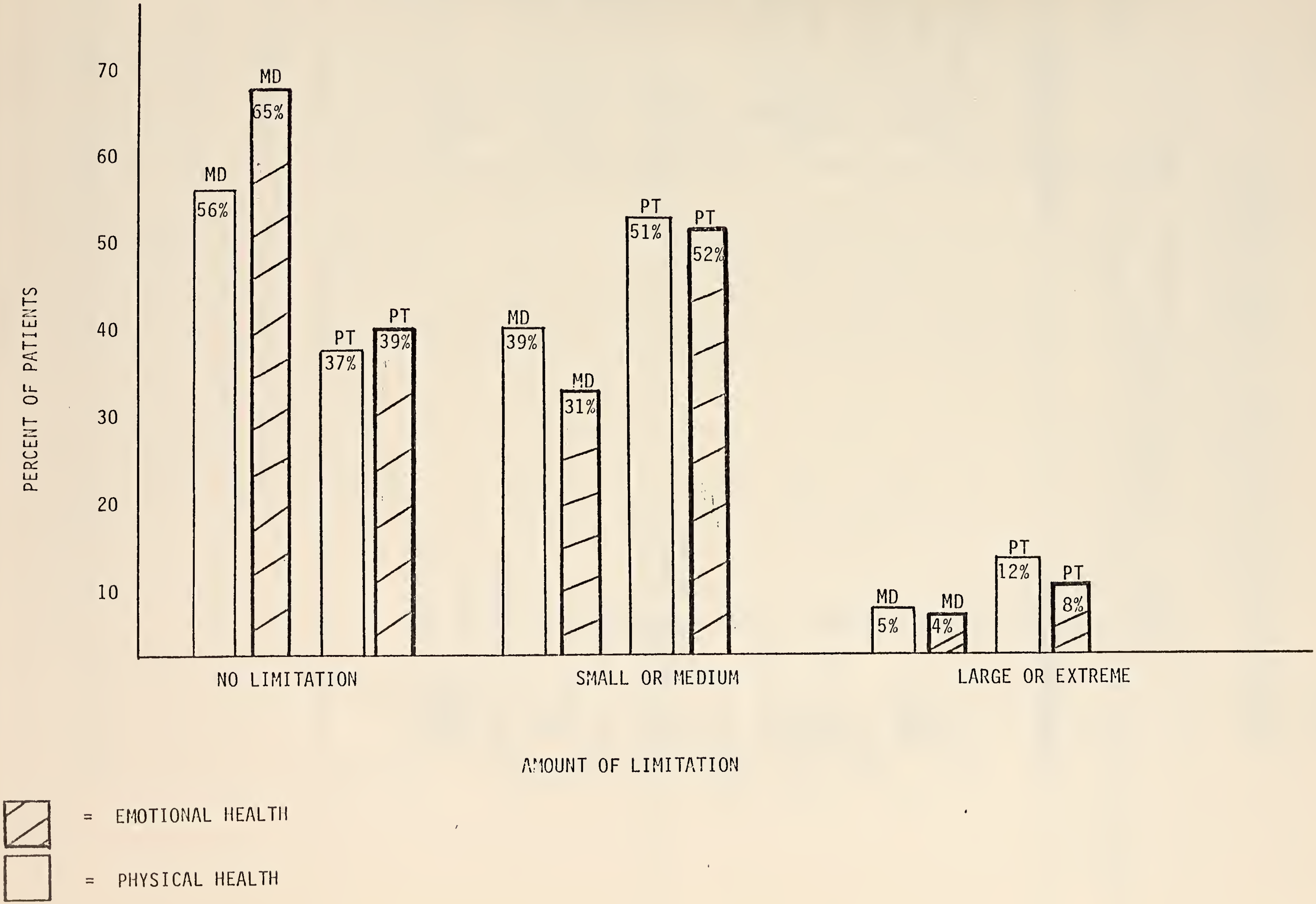

TABLE 1: CHARACTERISTICS OF PATIENTS IN STUDY

CHARACTERISTIC	PERCENT OF SAMPLE (N = 1227)
SEX	
Male	33%
Female	67%
AGE	
Less Than 30	25%
30 - 49	30%
50 - 69	30%
70 or Older	15%
EDUCATION	
Less Than 12 Years	24%
High Schoool Graduate	39%
Some College	37%
MARITAL STATUS	
Married	66%
Other	34%
OCCUPATIONAL STATUS	
Working/Homemaker	69%
Retired	24%
Unemployed/Student	7%

TABLE 2: PATIENTS' RATINGS OF PHYSICAL AND EMOTIONAL FUNCTIONING BY AVERAGE NUMBER OF OFFICE VISITS AND AVERAGE AMOUNT OF OFFICE CHARGES PER PATIENT PER YEAR **

TYPE OF FUNCTIONING	PATIENTS' RATINGS OF LIMITATION		
	NONE	SMALL OR MEDIUM	LARGE OR EXTREME
PHYSICAL*			
Average Office Visits Per Patient Per Year	3.3	4.2	7.3
Average Office Charges Per Patient Per Year	$78	$87	$253
(N)	(76)	(95)	(22)
EMOTIONAL@			
Average Office Visits Per Patient Per Year	3.1	4.7	7.0
Average Office Charges Per Patient Per Year	$78	$114	$185
(N)	(80)	(94)	(15)

* Physical Functioning: Missing Data on 7 Patients
Pearsons $r = 0.33$, $p < 0.001$

@Emotional Functioning: Missing Data on 9 Patients
Pearsons $r = 0.25$, $p < 0.001$

** Table based on ambulatory care visits to the patients usual source of care; it does not include services provided by other sources of care.

TABLE 3: RATINGS OF PHYSICAL FUNCTIONING DURING THE PAST MONTH BY PATIENT AND PHYSICIAN (N = 1101)

PATIENTS' RATINGS OF LIMITATION	PHYSICIANS' RATINGS OF LIMITATION			TOTALS
	NONE	SMALL OR MEDIUM	LARGE OR EXTREME	
NONE	29%*	8%	0.4%	37.4%
SMALL OR MEDIUM	25%	24%	2%	51.%
LARGE OR EXTREME	3%	7%	2%	12%
TOTALS	57%	39%	4.4%	100%

Kappa = 0.24　　Z Score = 10.19　　$p < .001$

* Percents indicate proportion of patients in total table within the cell. Percents have been rounded off to nearest whole number except for upper right hand cell.

TABLE 4: RATINGS OF EMOTIONAL HEALTH DURING THE PAST MONTH BY PATIENT AND PHYSICIAN (N = 1092)

PATIENTS' RATINGS OF LIMITATION	PHYSICIANS' RATINGS OF LIMITATIONS			TOTALS
	NONE	SMALL OR MEDIUM	LARGE OR EXTREME	
NONE	31%*	8%	0.6%	30.6%
SMALL OR MEDIUM	30%	20%	2%	52%
LARGE OR EXTREME	3%	4%	2%	9%
TOTALS	64%	32%	4.6%	100 %

Kappa = 0.18 Z Score = 7.84 $p < .001$

* Percents indicate proportion of patients in total table within the cell. Percents have been rounded off to nearest whole number except for upper right hand cell.

TABLE 5: DEMOGRAPHIC CHARACTERISTICS AND LEADING DIAGNOSES AMONG PATIENTS WITH "NO LIMITATION" VERSUS PATIENTS WITH "MAJOR LIMITATION" IN PHYSICAL FUNCTIONING

DESCRIPTOR	PATIENTS WHO RATED THEIR LIMITATION AS...	
	"NONE" N = 444	"LARGE OR EXTREME" N = 144
DEMOGRAPHIC CHARACTERISTICS:		
AGE: MEAN YEARS	41*	57*
PERCENT MALE	33%	35%
EDUCATION: MEAN YEARS	12.9*	11.6*
PERCENT EMPLOYED	60%*	27%*
MOST FREQUENT DIAGNOSES:		
Listed in rank order of frequency and showing percent of patients.	1. Hypertension (11%)	1. Atheroschlerotic Heart Disease (11%)
	2. Medical Exam (6%)	2. Diabetes (8%)
	3. Dermatitis (4%)	3. Congestive Heart Failure (6%)
	4. Pregnancy Care (4%)	4. Anxiety or Depression (5%)
	5. Birth Control (3%)	5. Hypertension (5%)
	6. Anxiety or Depression (3%)	6. C.O.P.D. (5%)
	7. Vaginitis (3%)	7. Arthritis (5%)

* Relevant test of significance (chi-square or t-test) is significant at $p < .001$ level.

APPENDIX ONE

Figure A describes some of the properties of the adult health status scales selected for use in this study to measure physical and mental function. These scales were developed and field tested by the Rand Corporation as part of its Health Insurance Study. The scales were designed to be sensitive to medical care and have established reliability and validity. The scales are still being refined by Rand to improve their theoretical basis and psychometric characteristics. The scales selected for this study were reasonable choices at the time, but it is expected that Rand will make better measures available in the future.

FIGURE A: RAND SCALES SELECTED TO MEASURE PHYSICAL AND MENTAL FUNCTIONING BY PATIENT SELF-REPORT METHOD

HEALTH DIMENSION	SCALE (NUMBER OF ITEMS)		MEANING OF SCALE	INTERNAL CONSISTENCY[1]	TEST-RETEST
PHYSICAL	Self-Care Limitations	(1)	Chronic Limitations in Self-Care (e.g., eating, dressing)	*	.99[2]
	Mobility Limitations	(3)	Chronic Limitations in Mobility (e.g., need help to go out)	.92	.99[2]
	Physical Ability II	(4)	Able to perform moderate/strenuous physical task (e.g., run short distance.	.89	@
	Role Activity Limitations	(3)	Chronic Limitations in role functioning (e.g., can't work)	.98	.92[2]
		11			
MENTAL	Anxiety	(5)	Feeling anxious, worried, tense during past month	.88	.70[3]
	Depression	(3)	Feeling depressed, down-hearted, blue during past month	.84	@
	Vitality	(4)	Felt energy, pep, vitality, during past month	.81	@
		12			

[1] Coefficient of reproducibility or Cronbach's Alpha.

[2] Gamma correlation between scores on alternate test forms four months apart.

[3] Product-moment correlation between alternate forms one week apart.

@ Not computed.

* Not relevant for single item scale.

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EXHIBIT 19 3/82

USE OF AN INTER-PRACTICE MEDICAL INFORMATION SYSTEM TO DEVELOP A DATA-BASED CLINICAL COST-CONSCIOUSNESS CURRICULUM IN FAMILY MEDICINE SETTINGS

(SUMMARY OF CONTENT)

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USE OF AN INTER-PRACTICE MEDICAL INFORMATION SYSTEM TO DEVELOP A DATA-BASED CLINICAL COST-CONSCIOUSNESS CURRICULUM IN FAMILY MEDICINE SETTINGS

I. GOALS AND OBJECTIVES

The overall goal of the seminar is to demonstrate the application of data from an inter-practice medical information system to teach clinical cost-consciousness--the impact of clinical decision-making on the costs of medical care--to medical students and residents in family medicine settings. The major objectives of the seminar are:

A. to describe the inter-practice medical information system,
B. to present examples of the educational materials we are incorporating into our teaching,
C. to discuss specific techniques for teaching clinical cost-consciousness in clinical settings, and
D. to encourage discussion and exchange of information regarding the teaching of clinical cost-consciousness.

II. BACKGROUND

Since private physicians make decisions which control 50% to 80% of the health care dollar in a milieu characterized by price variation and clinical uncertainty, educational strategies which provide cost-oriented learning experiences based on real life data offer an important contribution to medical education. In response to this we have developed a data-based cost-consciousness curriculum for medical students participating in a required community based primary care clerkship. The cornerstone of the educational approach we are implementing consists of on-site cost awareness teaching sessions involving preceptors and students. Cost-related issues, generated by the practice's own data, are the focus of discussion. A variety of learning experiences are available to the student preceptor thorugh an educational packet which contains teaching/

The learning packet is designed as a guide or reference--not as a text--and may be modified by the individual preceptor to suit his/her teaching style. It contains a set of teaching materials, derived largely from data produced by the Primary Care Cooperative Information Project which allows the preceptor to comfortably and knowledgeably introduce issues of cost with medical students and/or family medicine residents during the ordinary course of precepting. Since this data comes from the preceptors' own practices and from other similar practices which participate in the COOP Project, it has real and immediate applicability to the learners.

Several types of practice-based data can be presented such as:

- * procedure frequencies and charges
- * percent of patients by type of insurance coverage
- * variation of visit charges among primary care physicians+
    - --for selected patient groups
    - --for common office procedures
    - --for selected chronic problems

Seminar participants will receive examples of the learning packets to discuss and critique. We will focus on the types of student assignments which this approach makes possible and which can involve the students and residents as active learners. These include chart reviews of selected patients and cost-related results of selected COOP inter-practice clinical and management studies.

IV. CONCLUSION

There is an obvious need for increasing instruction in clinical cost-consciousness and teachers of family medicine should become more involved in this area. The value of the COOP approach as a demonstration

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+Figure 1--illustrative example of COOP Data showing inter-practice variation in charges.
Figure 2--copy of the patient encounter form used to gather data for the COOP Project.

model lies in its ability to place the awesome and confusing national figures on the costs of medical care in the context of the practice setting and clinical decision-making with respect to specific patients. According to a recent AAMC survey of U.S. medical schools, virtually no cost-containment education efforts are underway in community-based primary care settings. At the conclusion of the seminar, participants will be familiar with a variety of techniques for teaching clinical cost-consciousness in family medicine settings and understand the contribution a medical information system can make to the development of educational materials in this area.

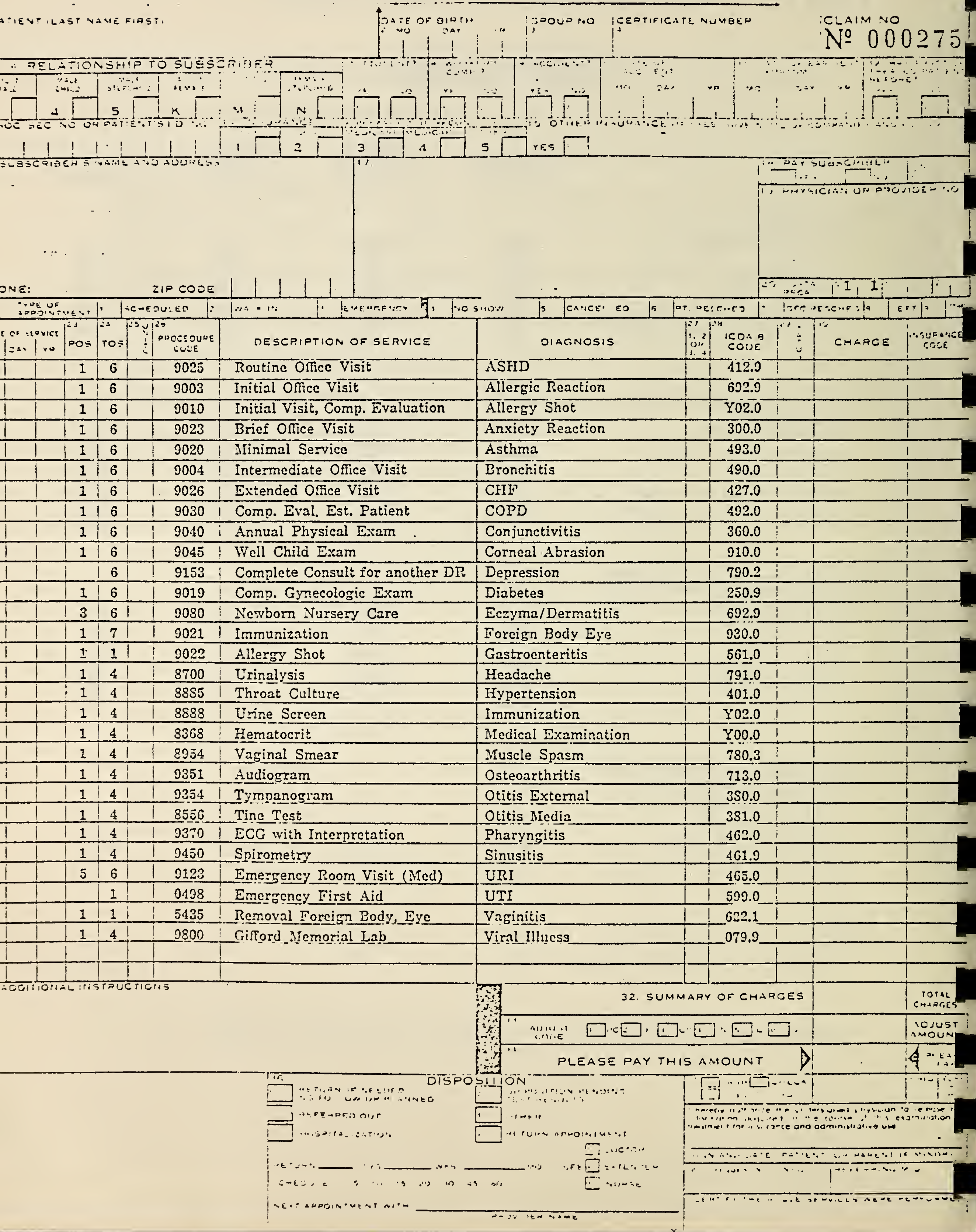
Figure 1 PRIMARY CARE COOPERATIVE INFORMATION PROJECT

Comparative Summary
Private Practices Only
January - June 1980

	Highest	Second Highest	Second Lowest	Lowest
% of on-site visits which are:				
routine - 9025	68%	67%	46%	41%
intermediate - 9026	15%	11%	3%	3%
brief - 9023	16%	14%	3%	1%
complete eval - 9030	9%	8%	0%	0%
annual physicial - 9040	14%	5%	0%	0%
Fees for office x visit procedures:				
routine - 9025	\$20	\$19	\$12	\$12
intermediate - 9026	\$30	\$27	\$17	\$14
brief - 9023	\$12	\$12	\$ 9	\$ 7
complete eval - 9030	\$65	\$50	\$25	\$25
annual physical - 9040	\$45	\$43	\$35	\$22
Average charge* per patient over 6 months:				
all patients	\$48	\$47	\$24	\$23
all 3-8	\$33	\$29	\$19	\$17
males 15-19	\$30	\$30	\$17	\$15
females 50-55	\$56	\$48	\$30	\$29
all 75+	\$58	\$56	\$32	\$27
Average visits per patient over 6 months with:				
chronic schemic heart disease (412)	3.9	3.8	2.8	2.6
hypertension (401)	3.9	3.1	2.4	1.4
arthritis (713 or 715)	4.3	3.4	2.4	1.5
Other:				
Average visits/MD/Monday	29	25	10	8
% payment at time of visit	54	52	6	2

* charge = visit charge only, i.e. no ancillary charges included

Figure 2



ATIENT (LAST NAME FIRST)

DATE OF BIRTH MO DAY YR

GROUP NO

CERTIFICATE NUMBER

CLAIM NO Nº 000275

RELATIONSHIP TO SUBSCRIBER

☐ 4 ☐ 5 ☐ K ☐ M ☐ N ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

SOC SEC NO OR PATIENT'S I D NO

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

OTHER INSURANCE

YES ☐

SUBSCRIBER'S NAME AND ADDRESS

17

PAY SUBSCRIBER

PHYSICIAN OR PROVIDER NO

ONE:

ZIP CODE

1 1

TYPE OF APPOINTMENT | 1 SCHEDULED | 2 | EMERGENCY | 4 NO SHOW | 5 CANCELLED | 6 PT. RESCHED | OFC RESCHED | 8 | EFT

E OF SERVICE	DAY	YR	23 POS	24 TOS	25	26 PROCEDURE CODE	DESCRIPTION OF SERVICE	DIAGNOSIS	27 1, 2 OR 3, 4	28 ICDA 8 CODE	29	30 CHARGE	INSURANCE CODE
			1	6		9025	Routine Office Visit	ASHD		412.9			
			1	6		9003	Initial Office Visit	Allergic Reaction		692.9			
			1	6		9010	Initial Visit, Comp. Evaluation	Allergy Shot		Y02.0			
			1	6		9023	Brief Office Visit	Anxiety Reaction		300.0			
			1	6		9020	Minimal Service	Asthma		493.0			
			1	6		9004	Intermediate Office Visit	Bronchitis		490.0			
			1	6		9026	Extended Office Visit	CHF		427.0			
			1	6		9030	Comp. Eval. Est. Patient	COPD		492.0			
			1	6		9040	Annual Physical Exam	Conjunctivitis		360.0			
			1	6		9045	Well Child Exam	Corneal Abrasion		910.0			
				6		9153	Complete Consult for another DR	Depression		790.2			
			1	6		9019	Comp. Gynecologic Exam	Diabetes		250.9			
			3	6		9080	Newborn Nursery Care	Eczyma/Dermatitis		692.9			
			1	7		9021	Immunization	Foreign Body Eye		930.0			
			1	1		9022	Allergy Shot	Gastroenteritis		561.0			
			1	4		8700	Urinalysis	Headache		791.0			
			1	4		8885	Throat Culture	Hypertension		401.0			
			1	4		8888	Urine Screen	Immunization		Y02.0			
			1	4		8368	Hematocrit	Medical Examination		Y00.0			
			1	4		8954	Vaginal Smear	Muscle Spasm		780.3			
			1	4		9351	Audiogram	Osteoarthritis		713.0			
			1	4		9354	Tympanogram	Otitis External		380.0			
			1	4		8556	Tine Test	Otitis Media		381.0			
			1	4		9370	ECG with Interpretation	Pharyngitis		462.0			
			1	4		9450	Spirometry	Sinusitis		461.9			
			5	6		9123	Emergency Room Visit (Med)	URI		465.0			
				1		0498	Emergency First Aid	UTI		599.0			
			1	1		5435	Removal Foreign Body, Eye	Vaginitis		622.1			
			1	4		9800	Gifford Memorial Lab	Viral Illness		079.9			

ADDITIONAL INSTRUCTIONS

32. SUMMARY OF CHARGES | TOTAL CHARGES

ADJUST CODE ☐ ☐ ☐ ☐ ☐ ☐ | ADJUST AMOUNT

PLEASE PAY THIS AMOUNT

DISPOSITION

☐ RETURN IF NEEDED NO FOLLOW UP PLANNED

☐ REFERRED OUT

☐ HOSPITALIZATION

☐ DISPOSITION PENDING TEST RESULTS

☐ OTHER

☐ RETURN APPOINTMENT

RETURN _____ _____ WKS _____ MO SEE ☐ DOCTOR ☐ EXTENDER ☐ NURSE

SCHEDULE 5 15 20 30 45 60

NEXT APPOINTMENT WITH __________

PROVIDER NAME

I hereby authorize the undersigned physician to release information acquired in the course of this examination or treatment for insurance and administrative use.

PATIENT OR PARENT IF MINOR

SERVICES WERE PERFORMED

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